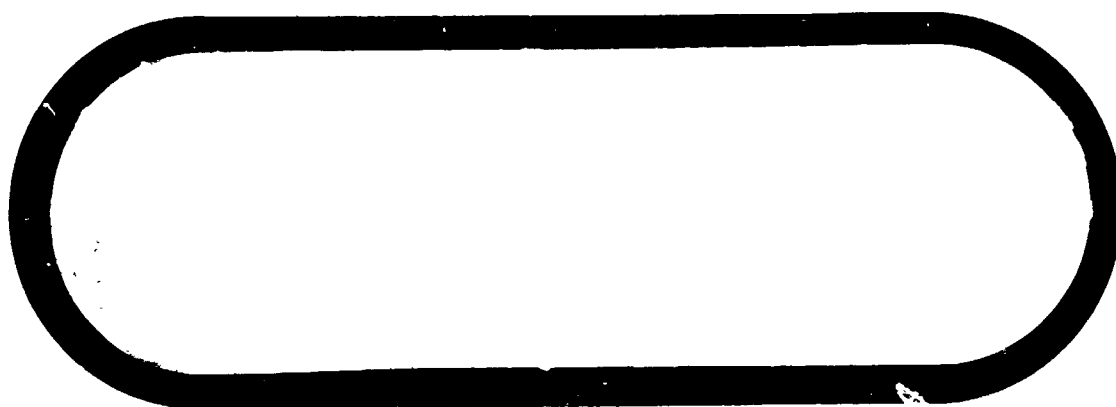


RELEASE AUTHORITY

ity

43

BOEING



FACILITY FORM 602

N70-35859	
(ACCESSION NUMBER)	(THRU)
<u>96</u>	<u>1</u>
(PAGES)	
<u>CR-110076</u>	<u>34</u>
(NASA CR OR TMA OR AD NUMBER)	(CATEGORY)



**APOLLO TIE
WASHINGTON, D. C.**

DOCUMENT NO. D2-117099-1

TITLE BOEING-TIE MANAGEMENT TECHNIQUES

MODEL NO. APOLLO

CONTRACT NO. NASw-1650

Program Integration

JULY 29, 1969

R. C. Uddenberg
R. C. Uddenberg

PROGRAM INTEGRATION MANAGER

ISSUE NO.

ISSUED TO

D2-117099-1

ABSTRACT

This document describes four selected management techniques developed by The Boeing Company for use on the Apollo-TIE Program (Teleservices, Apollo Mission Readiness Assessment Board, Program Concerns Data Bank, and the Washington, D.C.-TIE Work Administration System). It was produced to satisfy the customer's request that TIE management concepts be transitioned to NASA as Boeing disengaged from the overall inter-center TIE role.

Key Words

Teleservices
Telecommunications
Teleconference
Telecomputing

Program Concerns
Data Bank
Work Administration
Task Activity Record
Readiness Assessment

CONTENTS

	PAGE
1.0 INTRODUCTION	1-1
1.1 Purpose	1-1
1.2 Background	1-1
1.3 References	1-2
2.0 TELESERVICES	2-1
2.1 General	2-1
2.2 Telecommunication	2-1
2.3 Teleconferencing	2-1
2.4 Telecomputing	2-2
3.0 APOLLO MISSION READINESS ASSESSMENT BOARD (AMRAB)	3-1
3.1 Charter	3-1
3.2 Functions	3-1
3.3 Operation	3-2
3.4 Functions	3-3
4.0 PROGRAM CONCERNS DATA BANK	4-1
4.1 General	4-1
4.2 System Requirements	4-1
4.3 Concept Description	4-2
4.4 System Design	4-2
4.5 Operating Procedures	4-5
4.6 System Implementation	4-5
5.0 WORK ADMINISTRATION SYSTEM	5-1
5.1 Scope	5-1
5.2 Key Elements	5-1
5.3 System Flow	5-1
5.4 Conclusions	5-4
6.0 SUMMARY	6-1
Appendix A	

D2-117099-1

FIGURES

FIGURE		PAGE
2-1	Voice Communications, The Blue Net	2-4
2-2	Teleconference	2-5
2-3	Typical Teleconference Center and Equipment	2-6
2-4	Hard Copy Communications LDX	2-7
2-5	Agenda for AMRAB Meeting	2-8
2-6	Sample Teleconference Chart	2-9
2-7	Telecomputing	2-10
2-8	Telecomputing - Central Facility	2-11
2-9	Remote Terminal	2-12
3-1	AMRAB Review Process Flow	3-4
3-2	AMRAB Membership	3-5
3-3	Mission Readiness Assessment Open Item Summary Definition	3-6
3-4	Open Item Summary	3-7
3-5	Apollo 11 Open Items	3-8
3-6	AMRAB Program Concern History	3-9
4-1	Apollo TIE Data Requirements Definition	4-8
4-2	Common Function Data Category Requirements	4-9
4-3	Data Bank Program Concern Concept	4-10
4-4	Input and Retrieval Method	4-11
4-4A	Program Concern Data Module Operational Processing	4-11A
4-5	Program Concern Input Sheet #1	4-12
4-6	Program Concern Input Sheet #2	4-13

D2-117099-1

FIGURES

FIGURE		PAGE
4-7	Sample - Concern Data Output	4-14
4-8	Sample - Concern Data Output	4-15
4-9	Lunar Module Concerns Index	4-16
4-10	System Flow Diagram (Typical TIE Center)	4-17
5-1	WDC-TIE Work Administration Systems	5-4
5-2	Engineering Change Evaluation	5-5
5-3	Sample Task Activity Schedule	5-6
5-4	Activity Record Document	5-7

1.0 INTRODUCTION

1.1 Purpose

This document describes four selected management techniques developed and used by the Boeing Company for Apollo Technical Integration and Evaluation (TIE) under NASA Contract NASw-1650:

1. Teleservices
2. Apollo Mission Readiness Assessment Board (AMRAB)
3. Program Concerns Data Bank
4. Work Administration System

These techniques are described because they were developed to respond to the Apollo Program environment, and because they may be applicable to other OMSF program efforts. They do not represent great advancements in the development of management information hardware or software. However, because of the relatively short time period in which they had to be implemented, they are considered representative of unique applications of existing state-of-the-art toward developing and maintaining synergistic and effective program management.

1.2 Background

Apollo TIE is an Apollo Program contract with The Boeing Company to provide technical support to NASA in the implementation aspects of system engineering (Reference 1). Its purpose is twofold. First, it provides an overall Apollo-wide system integration and evaluation capability directed by the Apollo Program Director. Secondly, it provides technical capability at the MSF Center program level to meet needs that exist at the Centers for systems integration. The goal of Apollo TIE is to provide substantial assurance of mission readiness of the integrated space vehicle to the Apollo Program Director.

Upon entering the Apollo TIE program in June 1967, The Boeing Company was immediately faced with the problem of integrating an effort performed in part at Washington, D. C., in support of the Apollo Program Office, and in part at Huntsville, Ala., Houston, Texas, and Cape Kennedy, Florida, in support of the three MSF Field Centers. One answer to this problem was Teleservices, an integrated management communications network between the TIE locations (Section 2.0).

As a part of the Apollo TIE goal of providing assurance of mission readiness to the Apollo Program Director, Apollo TIE had to conduct numerous assessment activities. To manage this area, the Apollo Mission Readiness Assessment Board (AMRAB) was instituted. The Board has made extensive use of Teleservices in performing its functions. As the Apollo TIE effort progressed, the number of program concerns being assessed considerably increased. To maintain control over these concerns and monitor their status, the "Program Concerns Data Bank" was implemented. AMRAB and the Data Bank are described in Section 3.0 and 4.0, respectively. The Work Administration System which is described in Section 5.0 is an internal system used by Apollo TIE in the Washington, D. C. office to control work force activities.

1.3 References

- 1). M-D MA500 (MA001-000-1A), Apollo Program Development Plan, Apollo Program Office, NASA, Washington, D. C., October 15, 1968.
- 2). Wetmore, Warren C., "Boeing Network Cuts Apollo Work Cost," Aviation Week and Space Technology, February 10, 1969.
- 3). D2-1140502-1, Teleservices Operations Manual, The Boeing Company, Seattle, Washington.
- 4). D2-114503-1, Teleservices User's Guide, The Boeing Company, Seattle, Washington.
- 5). Committee Description, "Apollo Mission Readiness Assessment Board, The Boeing Company Manual - Aerospace Group," Seattle, Washington, (Appendix A, page A-1)
- 6). Apollo TIE Management Directive 470.1, "Program Concerns Data Bank". (Appendix A, page A-5)
- 7). Operating Procedure WDC 470.2 "Administration of Program Concerns Data Bank, Washington, D. C." (Appendix A, page A-7)
- 8). D2-117066-2, "Program Concern Data Bank Systems Specifications".
- 9). Management Directive WDC 500.8 "Apollo TIE Work Administration-Washington, D. C.". (Appendix A, page A-12)
- 10). Operating Procedure WDC 500.10 "Work Administration Procedure Apollo TIE-Washington, D. C." (Appendix A, page A-13)

D2-117099-1

- 11). Operating Procedure WDC 500.13 "Task Activity Records, Apollo TIE-Washington, D. C.". (Appendix A, page A-18)
- 12). Operating Procedure WDC 710.3 "Processing of NASA Technical Directives". (Appendix A, page A-24)
- 13). Management Directive WDC 515.1 "Correspondence Approval Routing, Signature Authority, and APO Interfaces, Washington, D. C.". (Appendix A, page A-28)
- 14). Office Instruction WDC 206 "Preparation of Document Information Record". (Appendix A, page A-33)
- 15). D2-117067-1, Activity Record Document WDC-TIE, The Boeing Company, Washington, D. C.
- 16). D2-117067-2, Activity Record Document WDC-TIE Historical Record, The Boeing Company, Washington, D. C.

2.0 TELESERVICES

2.1 General

Teleservices was established to provide effective and timely management information and program data interchange among the widely dispersed Apollo TIE locations. There are three major elements to Teleservices: Telecommunications, Teleconferencing and Telecomputing. Teleservices is credited with saving considerable travel time and expense for managers and engineers involved in the Apollo TIE program (Reference 2). These savings are readily apparent, however, other less tangible benefits, such as improved information flow, were probably of much greater value. One of the tools of successful project managers is the use of scheduled staff meetings. Without Teleservices, such meetings would have been severely limited for Apollo TIE because of the widespread distribution of TIE locations. Another principle of successful program management is the encouragement of the flow of problems to program management. Teleservices provided the necessary open door to management. The Apollo Program Office found the teleconferencing features of Teleservices so beneficial that they implemented a similar system.

Details on Teleservices are given in Reference 3 and 4. Following are some highlights on Teleservices equipment and operations:

2.2 Telecommunication

Normal voice transmission by telephone is provided by Teleservices for all employees. Of more importance to program management is a special network, called the "Blue Net" a dedicated high-fidelity voice communication conference network. The network provides rapid connection between key managers and teleconference centers, and provides flexible teleconference capability over a wide geographic area (Figure 2-1).

2.3 Teleconferencing

The teleconferencing technique developed under Teleservices is a unique application of teleconference centers, the "Blue Net", hardcopy transmission devices and special projection equipment, all integrated to provide simultaneous voice and visual communication between several locations. All equipment is installed in or near the teleconference centers. This integration of facilities and equipment, together with conference techniques and equipment operating procedures has provided an effective medium for management communication between Apollo TIE locations (Figure 2-2).

Facility and equipment installations are essentially identical for each teleconference center. As shown in Figure 2-3, these installations consist of communications equipment and three rear-projection viewing screens. The screens, located at one end of the conference room, allow projection of slides, movies, and viewgraphs. The rear-projection technique permits room illumination to remain at a reasonable level, eliminates shadows on the screen, and results in a clear, easily read image. The projectors, installed behind the screens, do not interfere with conduct of the meeting. The projectionists are party to the conference and respond to oral instructions from the speaker or conferees.

The voice communications system employs an optimum arrangement of speakers and microphones, and is connected to the "Blue Net" for maximum fidelity and convenience. The "Blue Net" operator locates and notifies participants and establishes conference connections and arrangement.

A Long Distance Xerography (LDX) network permits rapid distribution of conference projection material (Figure 2-4). It also allows transmission of special charts during a conference if some unforeseen display is required. The LDX network uses a scanner and printer at each location connected by a Bell System dedicated transmission link. When good quality originals are fed through the scanner, a copy comparable to a Xerox 914 is produced by the printer.

Teleconference coordinators located at each information center establish the communication network and ensure that all projection material is on hand, coordinated, and projected according to the conference agenda (Figure 2-5) and any other special instructions. (Normally, graphic information is transmitted to each site prior to a scheduled conference and is converted for rear-projection display. A sample of the standard format is shown in Figure 2-6.) The teleconference coordinators use LDX to transmit agenda and projection material to all conference locations and reserve circuits for broadcast transmission of any additional visual data required during the conference. Thermofax machines are used to convert LDX output to viewgraph transparencies. Material is thus available for simultaneous projection in all conference rooms within one to two minutes.

2.4 Telecomputing

The telecomputing portion of Teleservices provides computing requirements for the widely separated elements of Apollo TIE.

It consists of a central computing facility at Huntsville connected to input/output terminals at remote sites (Figures 2-7, 2-8, & 2-9). This arrangement provides two advantages:

1. Centralized and current management control to ensure common and standard procedures, efficient computer use by sharing and balancing computer loads from the various remote sites, a common library of computer programs, and a common MIS data base;
2. Significant cost savings over establishing and operating independent computer centers.

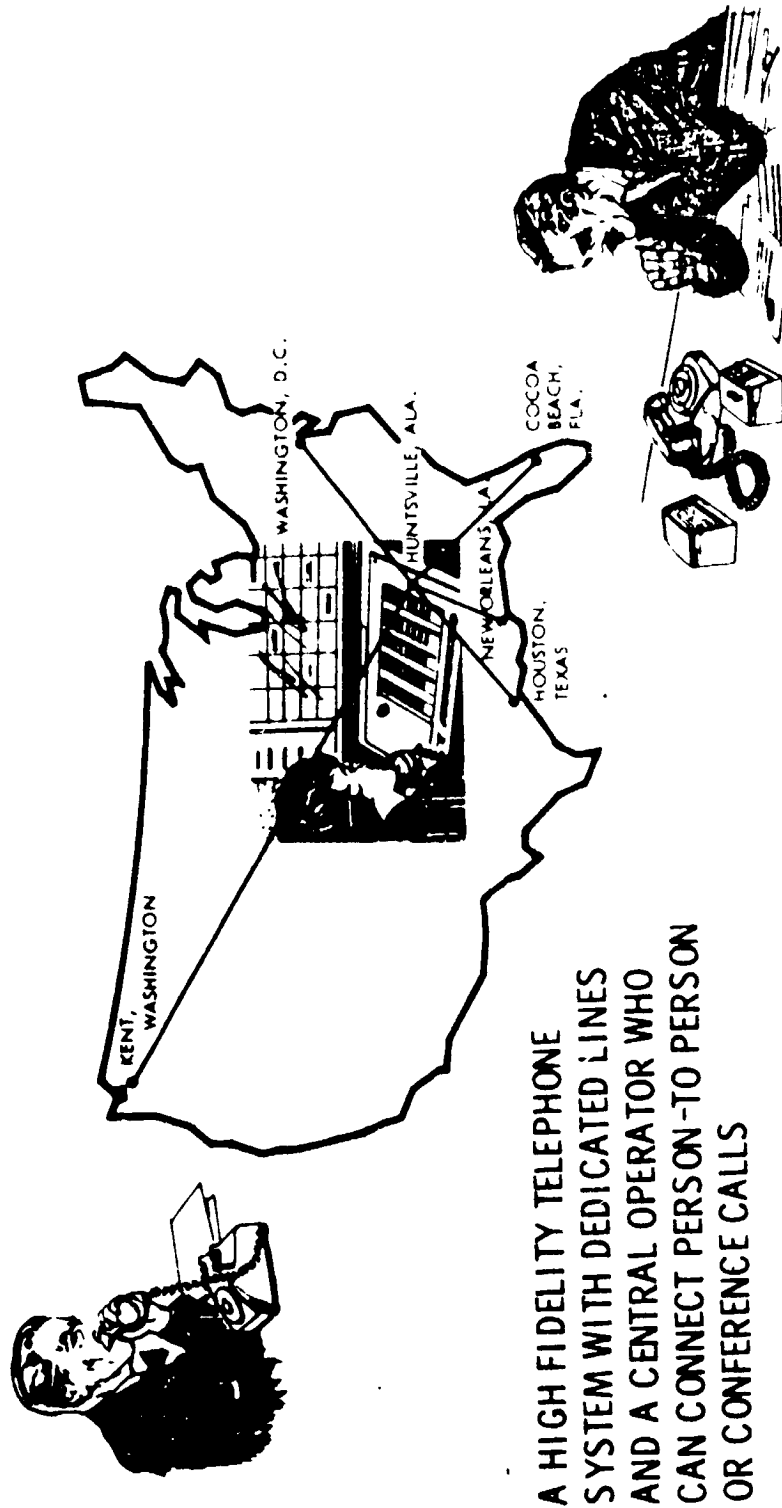
Remote site telecomputing terminal equipment includes IBM 360/30 computers with IBM 2740 communication terminal access, card readers (for input) and printers (for output) at Cocoa Beach, Houston, and Washington, D.C. The Kent location has IBM 2740 access only. Remote site terminal equipment is connected (via data sets and telephone lines) to the large-scale digital computers in the central computing facility at Huntsville. Basically, the terminals accept data on cards or from the typewriter of the IBM 2740, transmit the data to the central facility, and receive and print the output results on paper.

The central facility has two IBM 360/65 computers and an IBM 360/67 dual computer connected to the remote terminals. These multiple computers have access to on-line disk and tape data storage. Additional data storage is available in a magnetic tape library.

Two significant off-line devices at the central computing facility are available to users. The first, a BL-120 printer-plotter, produces graphic and text material on microfilm or hardcopy (8-1/2 inch roll) paper from computer-generated data on magnetic tape. Although the user can provide inputs to this process from the remote site via on-line terminal equipment, the output (microfilm, for example) is returned via the mail system. The second device, a CDC 915 optical page reader at Huntsville, enables computer inputs on magnetic tape to be made from a typewritten page. This allows bypassing the time-consuming manual card keypunching.

TELECOMMUNICATIONS

THE BLUE NET

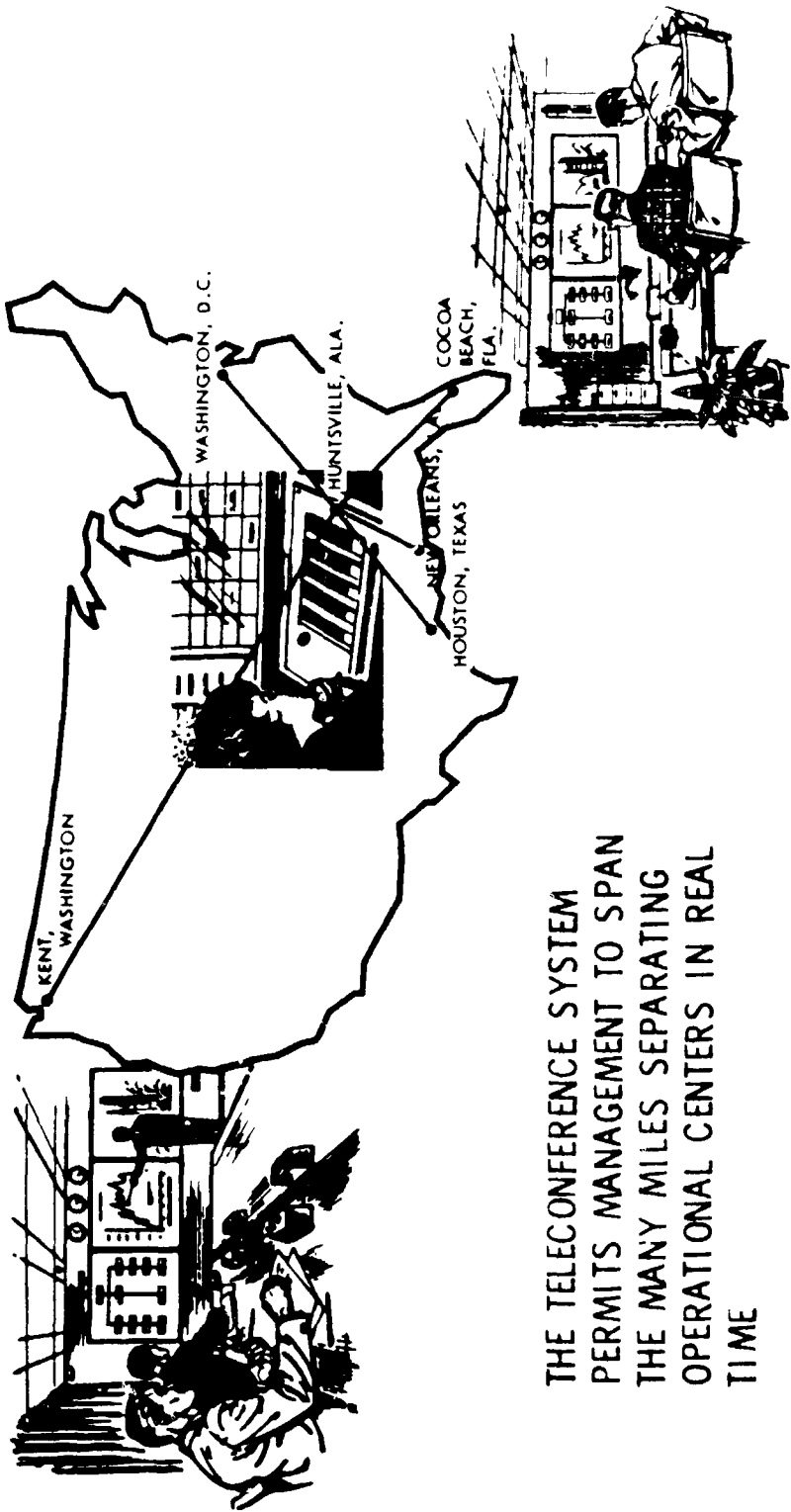


A HIGH FIDELITY TELEPHONE
SYSTEM WITH DEDICATED LINES
AND A CENTRAL OPERATOR WHO
CAN CONNECT PERSON-TO PERSON
OR CONFERENCE CALLS

- CAN SUPPORT INDIVIDUAL CALLS
AND TELECONFERENCE SIMULTANEOUSLY.

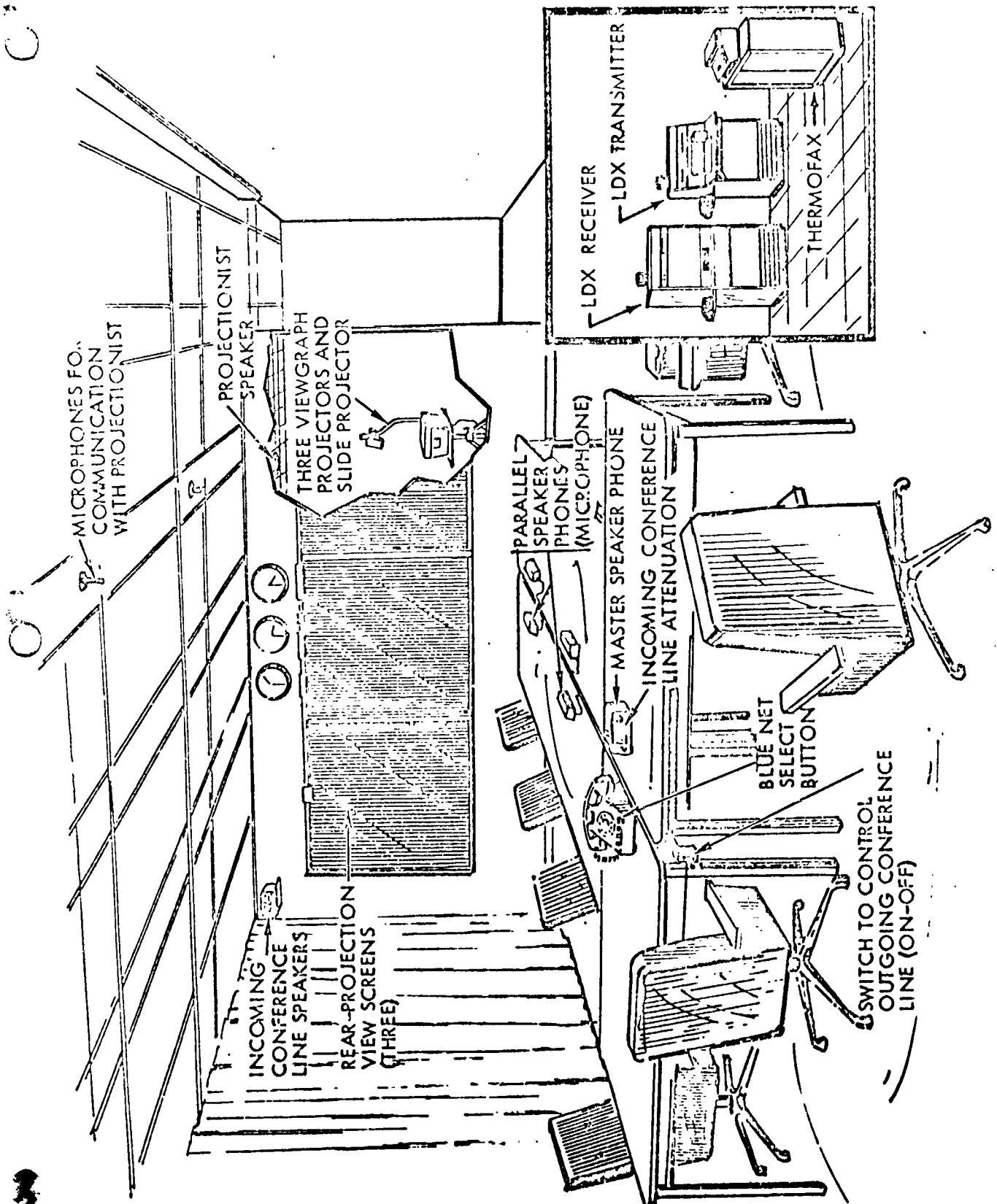
Figure 2-1

TELECONFERENCE



THE TELECONFERENCE SYSTEM
PERMITS MANAGEMENT TO SPAN
THE MANY MILES SEPARATING
OPERATIONAL CENTERS IN REAL
TIME

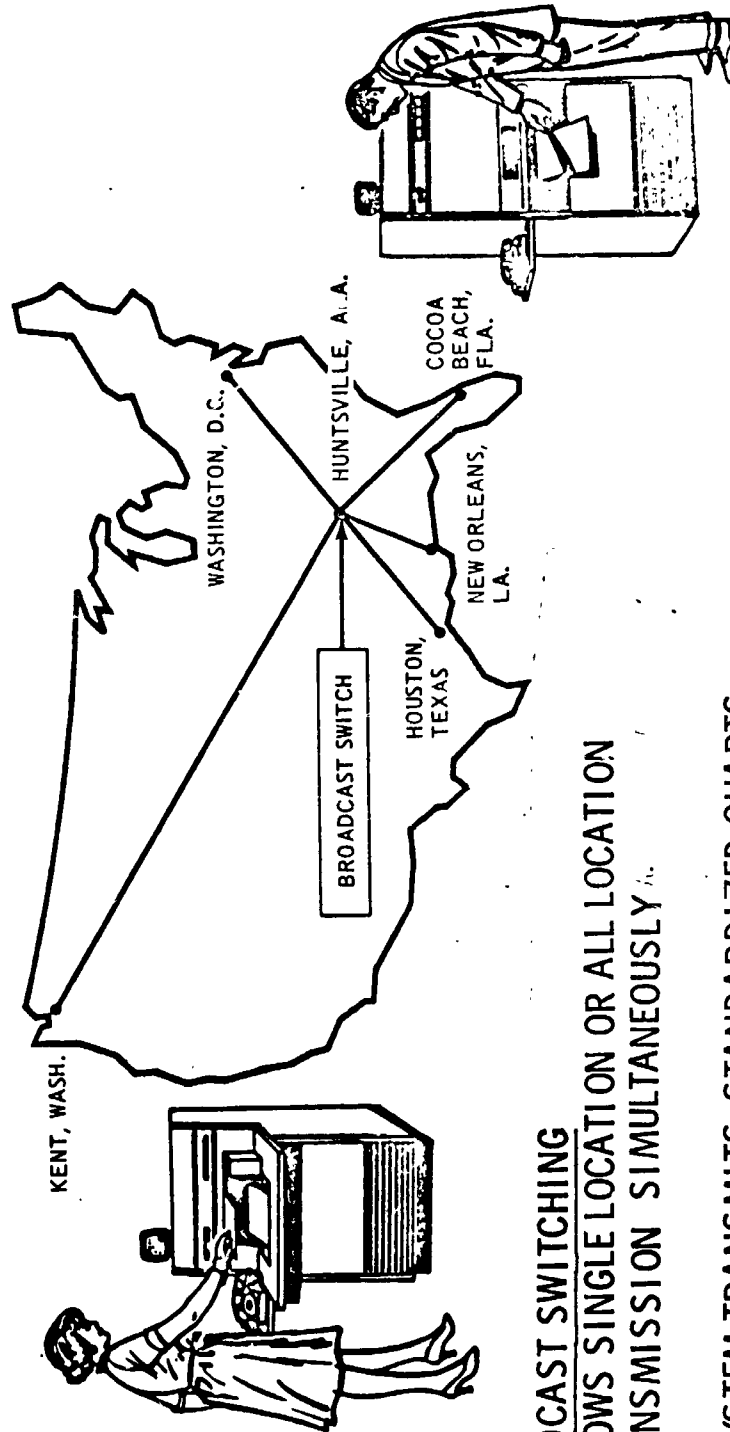
Figure 2-2



TYPICAL TELECONFERENCING CENTER & EQUIPMENT

FIGURE 2-3

TELECOMMUNICATIONS HARD COPY COMMUNICATIONS-LDX



- BROADCAST SWITCHING
 - ALLOWS SINGLE LOCATION OR ALL LOCATION TRANSMISSION SIMULTANEOUSLY
- LDX SYSTEM TRANSMITS STANDARDIZED CHARTS
 - 8 1/2 x 11-IN. LETTERS, CHARTS, DOCUMENT PAGES, ETC.
 - 1-3/4 PAGES PER MINUTE

- VIEWFOILS MADE LOCALLY FROM TRANSMITTED MATERIAL
 - USES THERMOFAX MACHINES
 - TIME REQUIRED, LESS THAN ONE MINUTE



S A M P L E

AGENDA FOR AMRAB MEETING
APOLLO 11 MISSION READINESS
JUNE 13, 1969, 12:00 NOON, EDT

DATE: JUNE 9, 1969

BY: C. A. WILKINSON

CHART: _____

1. INTRODUCTION AND ROLL CALL
2. ASSESSMENT SCHEDULE AND APOLLO 11
ACTIVITIES UNTIL LAUNCH
3. APOLLO 11 CONCERNS SUMMARY
4. REPORT ON APOLLO 11 CONCERNS, INCLUDING APOLLO 10
ANOMALIES AND PRIOR MISSION ACCEPTED RISKS
 - SPACECRAFT
 - LAUNCH VEHICLE
 - LAUNCH COMPLEX
 - INTEGRATED SYSTEM
5. CONFIGURATION DELTAS SUMMARY
6. SINGLE POINT FAILURE REVIEW
 - REPORT ON C. A. WILKINSON'S MEMORANDUM
5-2000-1-283, DATED MAY 26, 1969
7. MISSION RULES REVIEW
8. REVIEW OF PRELIMINARY APOLLO 11 ASSESSMENT LETTER
9. SUMMARY

C. A. WILKINSON

R. C. UDDENBERG

R. L. CAMPBELL

H. BORING

D. HOWARD

C. G. PAGE

R. L. CAMPBELL

R. L. CAMPBELL

R. L. CAMPBELL

ALL CENTERS

R. L. CAMPBELL

C. A. WILKINSON

C. A. WILKINSON

SAMPLE TELECONFERENCE CHART


 CHART: W-3-1		DATE: _____ BY: _____
	ORIGINATING LOCATION	DATE: _____ BY: _____
AGENDA ITEM NO. REF NO.		
<div>• EASILY TRANSMITTED BY LDX</div> <div>• EASILY "CALLED UP" AT EACH LOCATION, BY NUMBER</div> <div>• PERMANENT RECORD OF MEETING DETAILS AT EACH LOCATION</div> <div>• COMMAND MEDIA ESTABLISH AND DEFINE TELECONFERENCE CHART/VIEWGRAPH QUALITY STANDARDS</div>		

FIGURE 2-6

TELECOMPUTING

TELECOMPUTING USES REMOTE
TERMINALS TO TRANSMIT
COMPUTING JOBS TO A CENTRAL
FACILITY

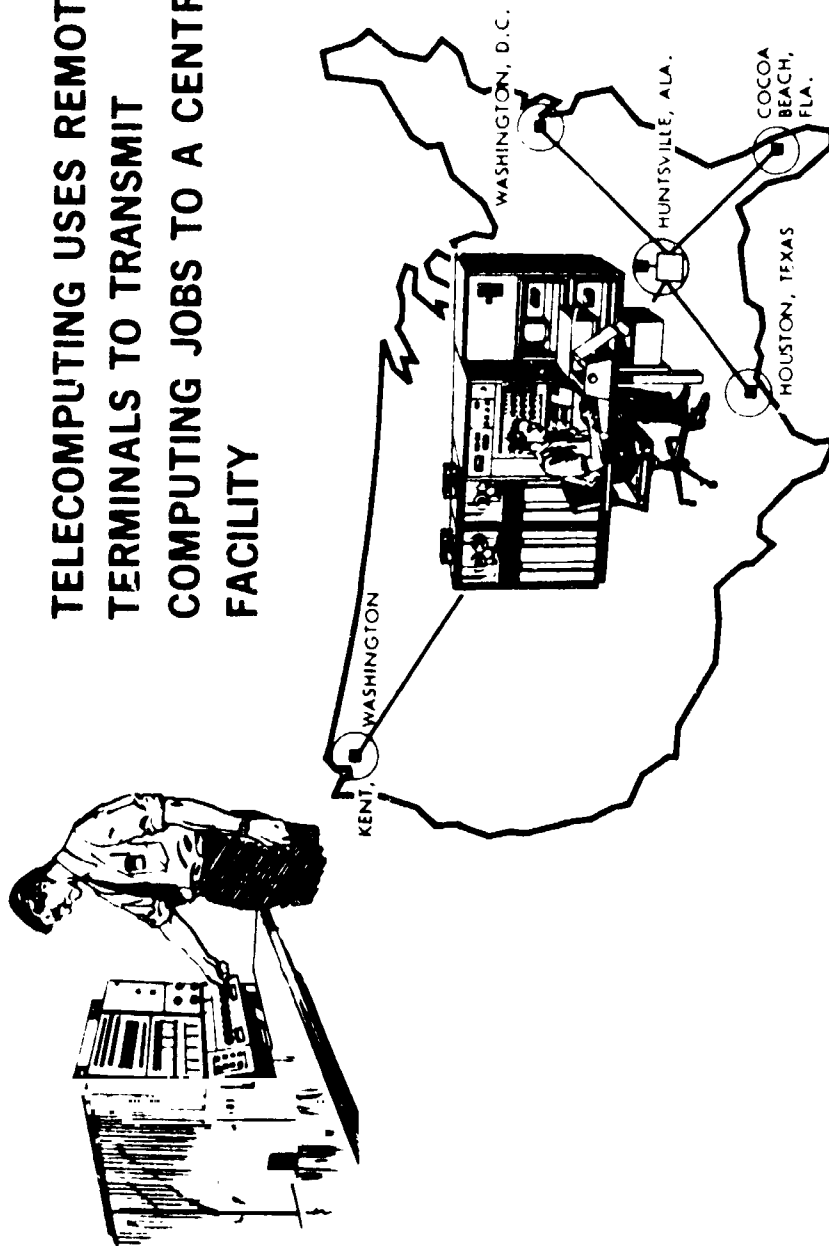


Figure 2-7

TELECOMPUTING CENTRAL FACILITY

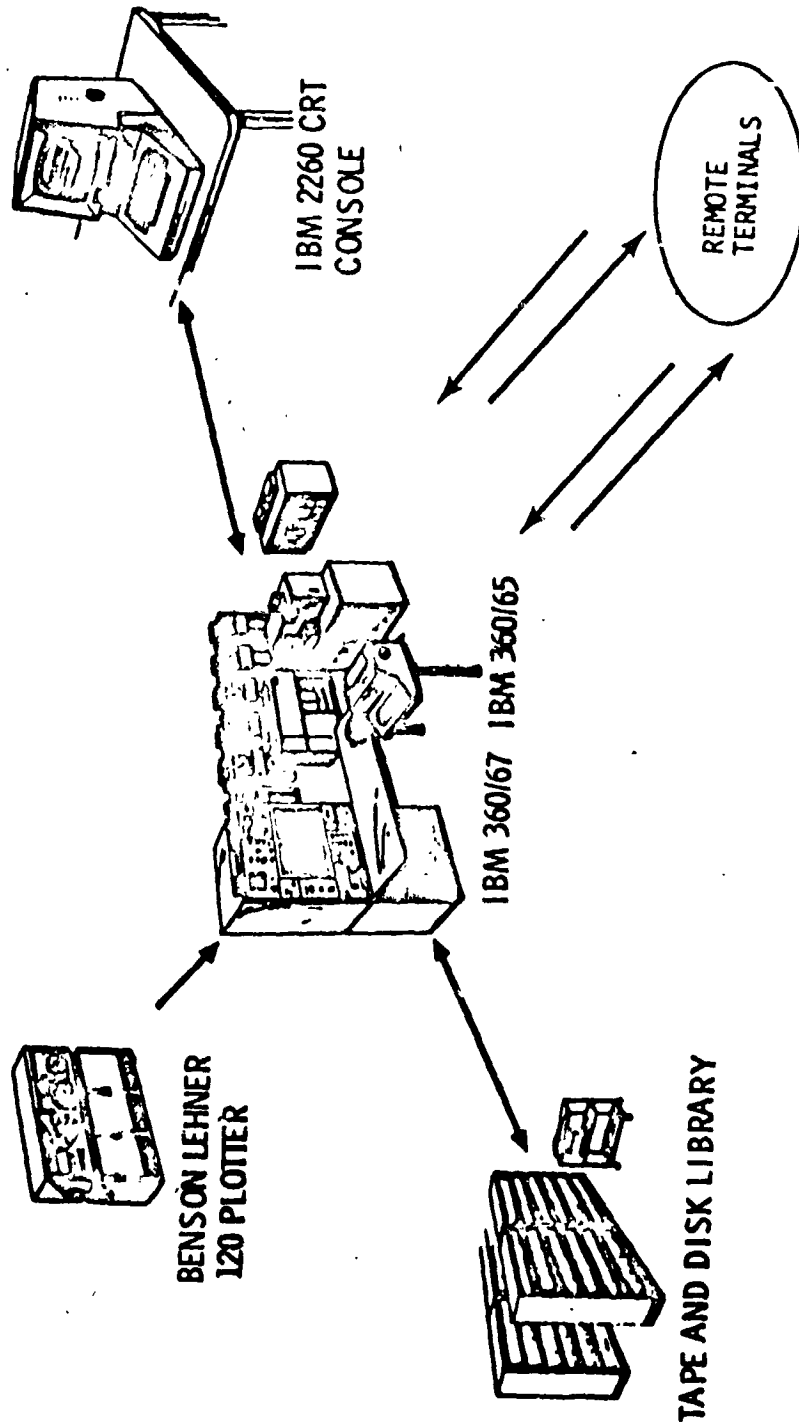


FIGURE 2-8

REMOTE TERMINAL

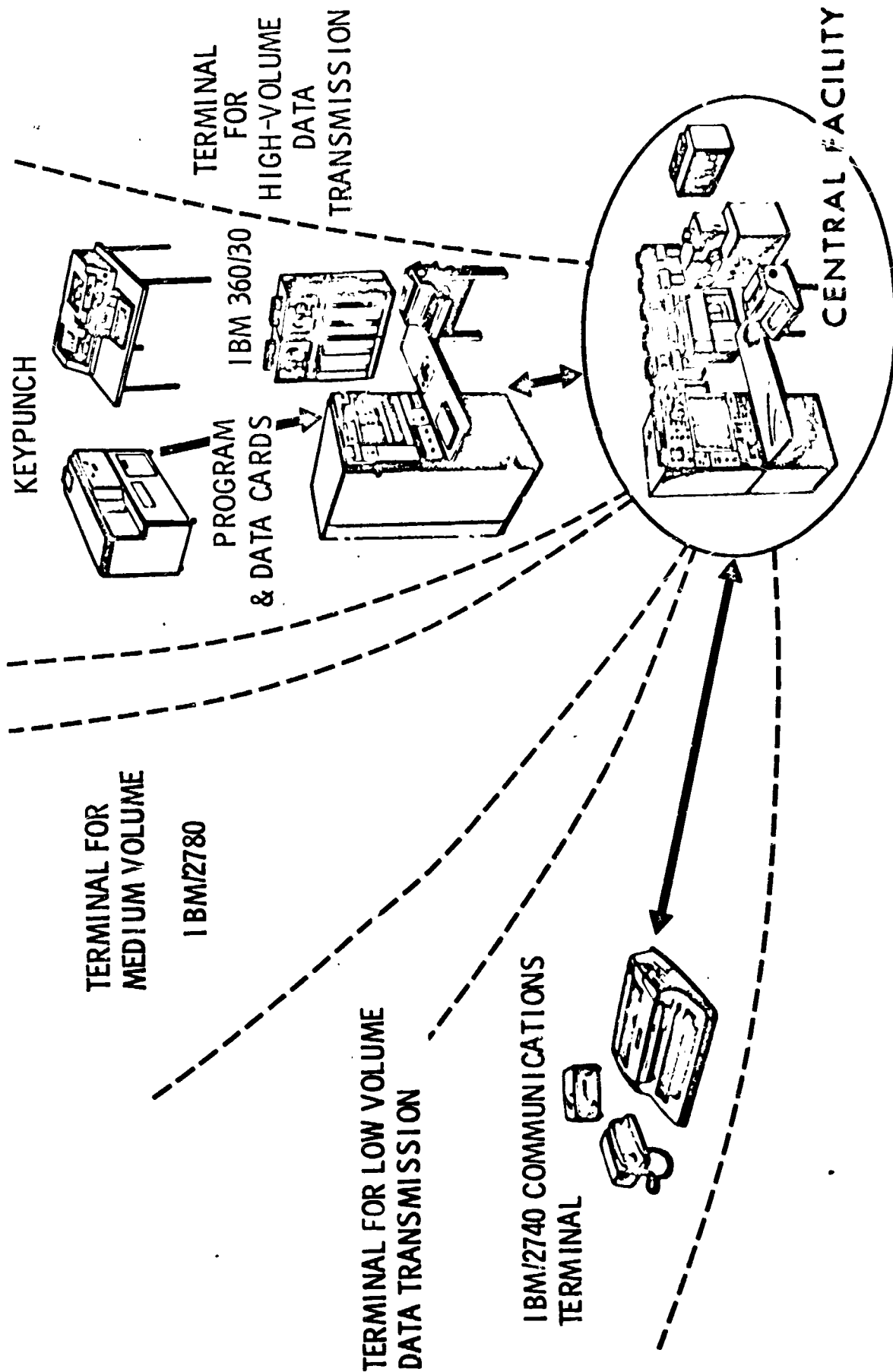


FIGURE 2-9

3.0 APOLLO MISSION READINESS ASSESSMENT BOARD (AMRAB)

3.1 Charter

As a part of the Apollo TIE goal of providing substantial assurance of mission readiness to the Apollo Program Director, The Boeing Company conducts an Apollo Mission Readiness Assessment prior to each mission. AMRAB was chartered (Reference 5) to examine the activities that lead to these assessments. The Board initiates, reviews and monitors any necessary actions to achieve a sound assessment and assure maximum effectiveness of the Company's overall TIE participation in the Apollo Program. Figure 3-1 presents a flow chart depicting Board activities.

AMRAB is a combination of top Aerospace Systems Division Management, top responsible managers at each location, and top professional talent (See Fig 3-2). Board membership includes the Apollo TIE manager, as chairman, managers of the TIE locations, a program integration manager as secretary and non-voting member, and professional members representing the functions of Engineering, Test, Safety, and Configuration Management and Interface Engineering.

3.2 Functions

Each professional member develops criteria and provides guidance to all TIE locations for the preparation of an assessment for his responsible function. Mission Readiness Assessment Matrix (Figure 3-3), defines the minimum requirements for each mission readiness assessment. Each professional board member includes as a minimum these items in his assessment plan. Program Integration at each Center location integrates the functional area reports into a Center Mission Assessment for review and approval by the TIE Center manager. After approval the reports are forwarded to the Program Integration professional member for integration into an overall TIE mission assessment document. This document, which is prepared for each mission, summarizes in one place the total TIE assessment activities and is submitted to the Apollo Program Director and used to support him in the identification and resolution of mission problems.

Supporting this assessment process and the AMRAB are a Readiness Assessment Manager (RAM) and Deputies appointed by the Board Chairman for a specific flight mission. (On later missions, the RAM has been the WDC-TIE Engineering Manager). All assessment activities are accomplished under their guidance by the functional and line organizations designated as having that responsibility. AMRAB functions as the Apollo TIE senior readiness assessment monitoring organization and as the final judge of the adequacies of Mission Readiness Assessment activities for each Apollo mission. Problem areas can result in action item assignments.

TIE location Managers appoint a single point of contact for action items levied on them by AMRAB. It is the responsibility of the single point contact to provide status information and feedback to the Board Chairman and to the Board Secretariat for reporting to the AMRAB.

3.3 OPERATION

Several kinds of material come before the Board for its review.

"Mission Readiness Trend Data" is a detailed listing of the open items in each of the eleven basic categories at each Center. Each TIE Management Information Center displays and maintains calendar plots which show trends in each category. A summary for all Centers at a given point in time is shown in Figure 3-4, and a typical overall trend chart of this summary data in Figure 3-5. Program Integration and Board members use this trend data to ensure that open items are worked as far upstream as possible.

Not all "open items" are "Program Concerns", but all items which become Program Concerns come before the Board and are carefully tracked. Program Integration organizations maintain a Program Concern Data Bank (Section 4.0) that is the repository for concerns identified by Apollo TIE organizations. There are four categories of concern:

1. Open Impact - a mission problem impacting ground or flight crew safety and/or mission success which may still exist at launch day.
2. Open Track - Rework, spares deficiencies, test and/or analysis to be performed to resolve a problem for which current action is assessed as satisfactory, but should be tracked to close out.
3. Acceptable Risk - A mission problem for which sufficient action has been taken to justify proceeding with the mission, in the judgement of TIE management.
4. Satisfactory Resolution - an identified problem adequately resolved to allow flight.

Program Integration, in conjunction with the functional technical organizations reviews the concerns to determine those critical items that should be presented to the Board. Any Board member can present additional concerns judged to be critical to the Board for review. Program Integration integrates all data pertaining to a concern and prepares material for presentation to the AMRAB.

Typical concerns and concern listings are shown in Section 4.0. A typical history of the concerns coming before the Board, and of their disposition, is shown in Figure 3-6.

3.4 PRODUCTS

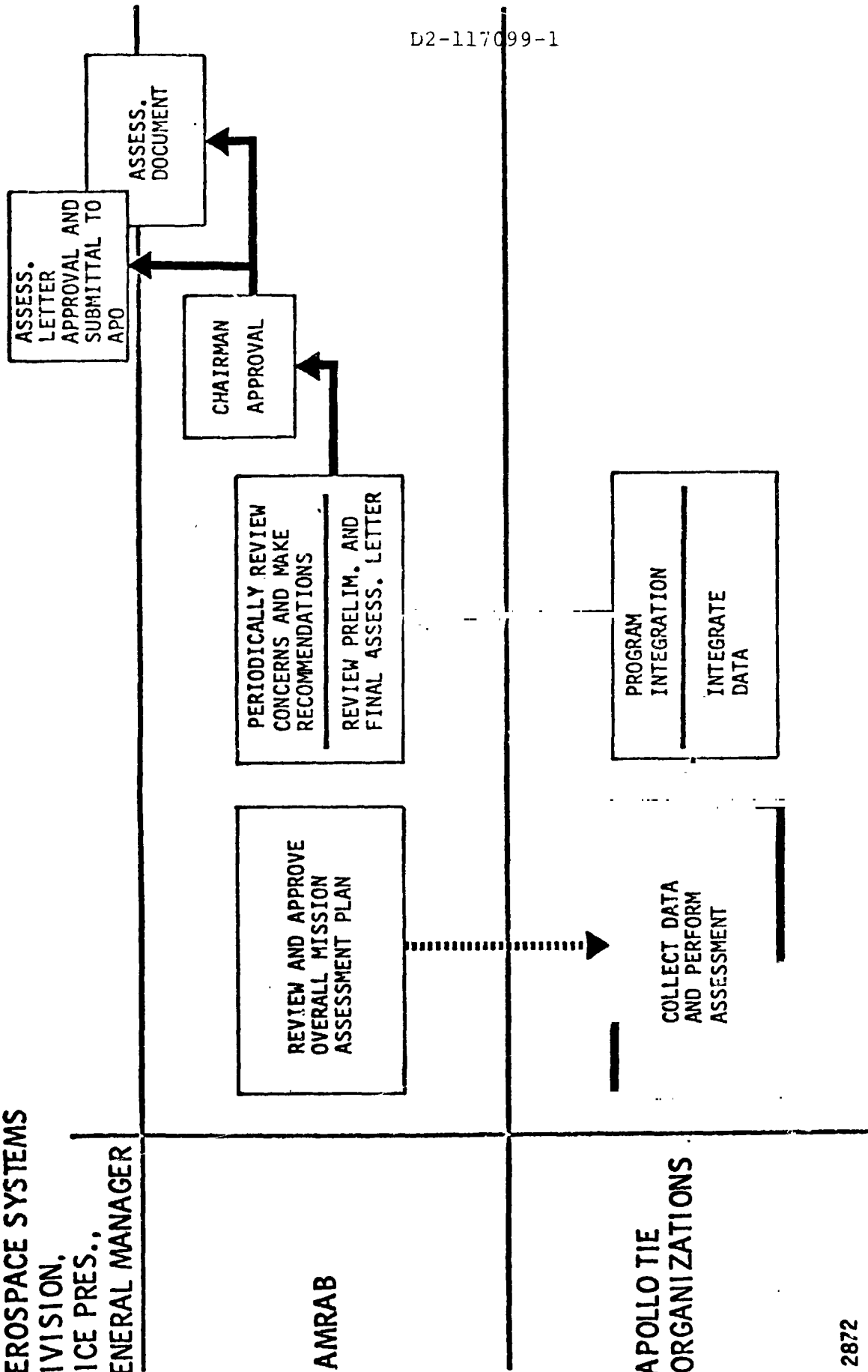
The end products of the AMRAB activities are Boeing assessment letters and a document to the Apollo Program Director validating the Company position on the readiness of each flight mission.

AMRAB REVIEW PROCESS FLOW

AEROSPACE SYSTEMS
DIVISION,
VICE PRES.,
GENERAL MANAGER

AMRAB

APOLLO TIE
ORGANIZATIONS



D2-117099-1

2872

FIGURE 3-1

APOLLO TIE MISSION READINESS
ASSESSMENT BOARD

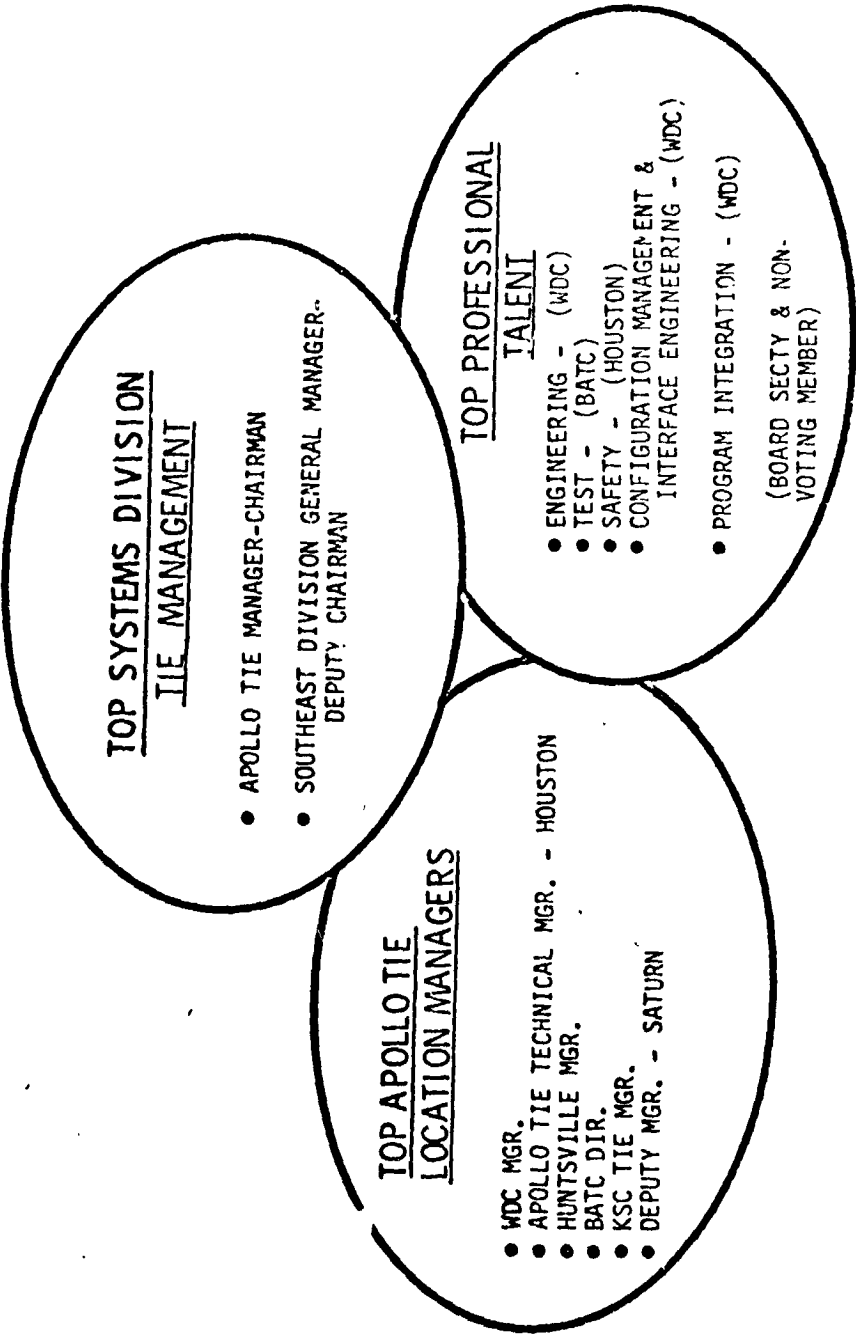


FIGURE 3-2

MISSION READINESS ASSESSMENT OPEN ITEM SUMMARY DEFINITIONS

MAT RIX NO.	TITLE	DEFINITIONS
1	OPEN MANDATORY MODIFICATIONS	ALL UNCOMPLETED CHANGES REQUIRING RETRO FIT TO HARDWARE, SOFTWARE AND/OR DOCUMENTATION NECESSARY TO LAUNCH THE SPACE VEHICLE
2	OPEN FAILURE REPORTS	ALL OPEN FAILURE REPORTS (UCR OR EQUIVALENT) FOR WHICH ACTION MUST BE COMPLETED TO ACHIEVE FLIGHT READINESS
3	UNAVAILABLE LAUNCH CRITICAL SPARES	THOSE LOGISTICS PRODUCTS WHICH COULD CONSTRAIN A MAJOR READINESS TEST OR A LAUNCH DUE TO FAILURE WITH NO AVAILABLE REPLACEMENT
4	WAIVERS & DEVIATIONS TO CEI SPECS	APPLICATIONS AND/OR NOT YET APPROVED WAIVERS TO CONTRACTOR END ITEM SPECIFICATIONS
5	UNQUALIFIED COMPONENTS	ALL HARDWARE COMPONENTS WHICH HAVE NOT COMPLETED QUALIFICATION TESTING AND WHICH ARE REQUIRED TO BE QUALIFIED PRIOR TO LAUNCH BY CONTRACTOR OR NASA DOCUMENTATION
6	OPEN ICD'S AND IRN'S	ALL OPEN LAUNCH CRITICAL ICD'S AND IRN'S WHICH MUST BE CLOSED PRIOR TO LAUNCH
7	OPEN SCN'S	ALL OPEN LAUNCH CRITICAL SPECIFICATION CHANGE NOTICES WHICH MUST BE CLOSED PRIOR TO LAUNCH
8	OPEN ITEMS FROM SAFETY REVIEW	ITEMS FROM SAFETY REVIEWS FOR WHICH ACTION MUST BE COMPLETED TO ACHIEVE FLIGHT READINESS
9	OPEN PRIOR FLIGHT ANOMALIES	THOSE UNRESOLVED ANOMALIES WHICH HAVE OCCURRED DURING PREVIOUS APOLLO FLIGHTS AND MUST BE CLOSED TO ACHIEVE FLIGHT READINESS
10	CONFIGURATION DIFFERENCES	HARDWARE AND SOFTWARE DIFFERENCE BETWEEN THOSE OF PREVIOUS MISSIONS AND THE MISSION BEING ASSESSED NOTING ITEMS TO BE PLANNED FOR THE FIRST TIME
11	SYSTEMS LEVEL ASSESSMENTS AND MISCELLANEOUS CONCERNS	SUMMARY OF THE STATUS AND RESULTS OF SELECTED ASSESSMENTS AND SPECIAL STUDIES, PLUS PROGRAM CONCERNS NOT IDENTIFIABLE WITH ANY OF THE OTHER ASSESSMENT ITEMS

N A S A

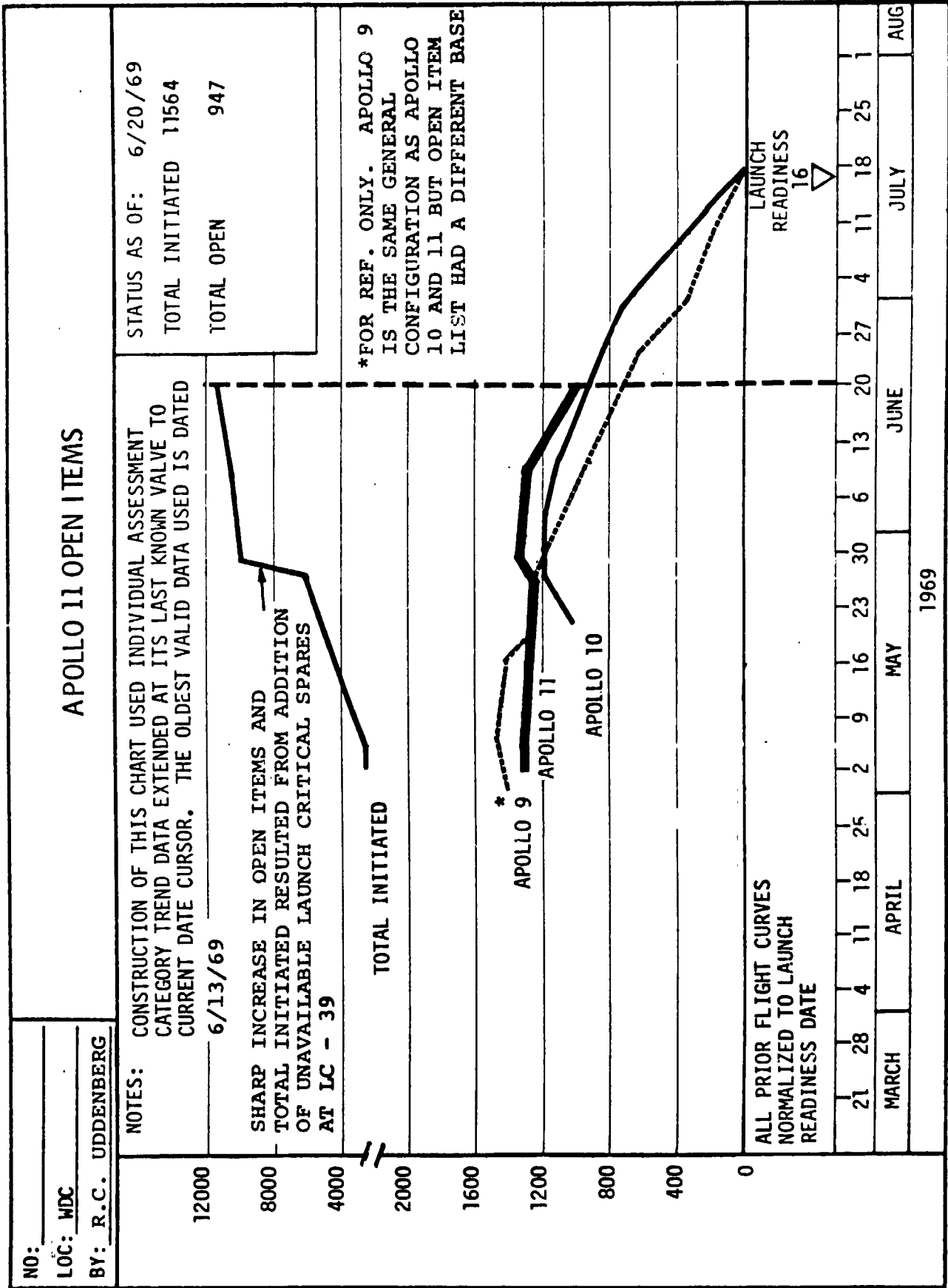
B O E I N G

FIGURE 3-3

MISSION READINESS ASSESSMENT OPEN ITEM SUMMARY

MAT RIX NO.	TITLE	S/C						LV										LC-39			INTEG. SYS.
		LM		CSM		EMU	S-IC		S-II		S-IVB		IU		LV/ LV GSE	ML/ MSS	FAC				
		S/C	GSE	S/C	GSE		S-IC	GSE	S-II	GSE	S-IVB	GSE	IU	GSE							
N A S A	1	OPEN MANDATORY MODIFICATIONS	61	ND	29	ND	ND	ND	0	1	0	0	2	1	0	0	36	2	3		
	2	OPEN FAILURE REPORTS	163	ND	109	ND	13	ND	1 F-1	1	0	0	1	0	0	0	0	0			
	3	UNAVAILABLE LAUNCH CRITICAL SPARES	12	ND	5	ND	ND	ND	0	0	0	0	0	0	0	0	0	48	60		
	4	WAIVERS & DEVIATIONS TO CEI SPECS	0	ND	0	ND	ND	ND										ND	ND		
	5	UNQUALIFIED COMPONENTS	41	ND	4	ND	ND	ND	0	0	0	0	0	0	0	0	0	5	2		
	6	OPEN ICD'S AND IRN'S	0	ND	8	ND	ND	ND					41					9	11		
	7	OPEN SCN'S	14	ND	13	ND	ND	ND													
B O E I N G	8	OPEN ITEMS FROM SAFETY REVIEW	3	ND	0	ND	1	ND	1	0	0	0	0	0	0	0	0	0	0		
	9	OPEN PRIOR FLIGHT ANOMALIES	7	ND	20	ND	ND	ND	0	0	0	0	0	0	0	0	0	11	3	0	
	10	CONFIGURATION DIFFERENCES	0	ND	0	ND	ND	ND	27	1	51	7	24	4	4	0	1	0	0		
	11	SYSTEMS LEVEL ASSESSMENTS AND MISCELLANEOUS CONCERNS	11*	ND	21*	ND	4	ND	0	0	0	0	0	0	0	0	0	13	36	0	
	TOTAL	312	ND	209	ND	18	ND	29	2	53	7	27	5	4	0	37	0	203	0		
		INCLUDED IN GRAND TOTAL																			947
		* INCLUDES OPEN ITEMS FROM NASA REVIEWS																			

* INCLUDED IN GRAND TOTAL BUT NOT IN SUBTOTALS
 * INCLUDES OPEN ITEMS FROM NASA REVIEWS STATUS AS OF:



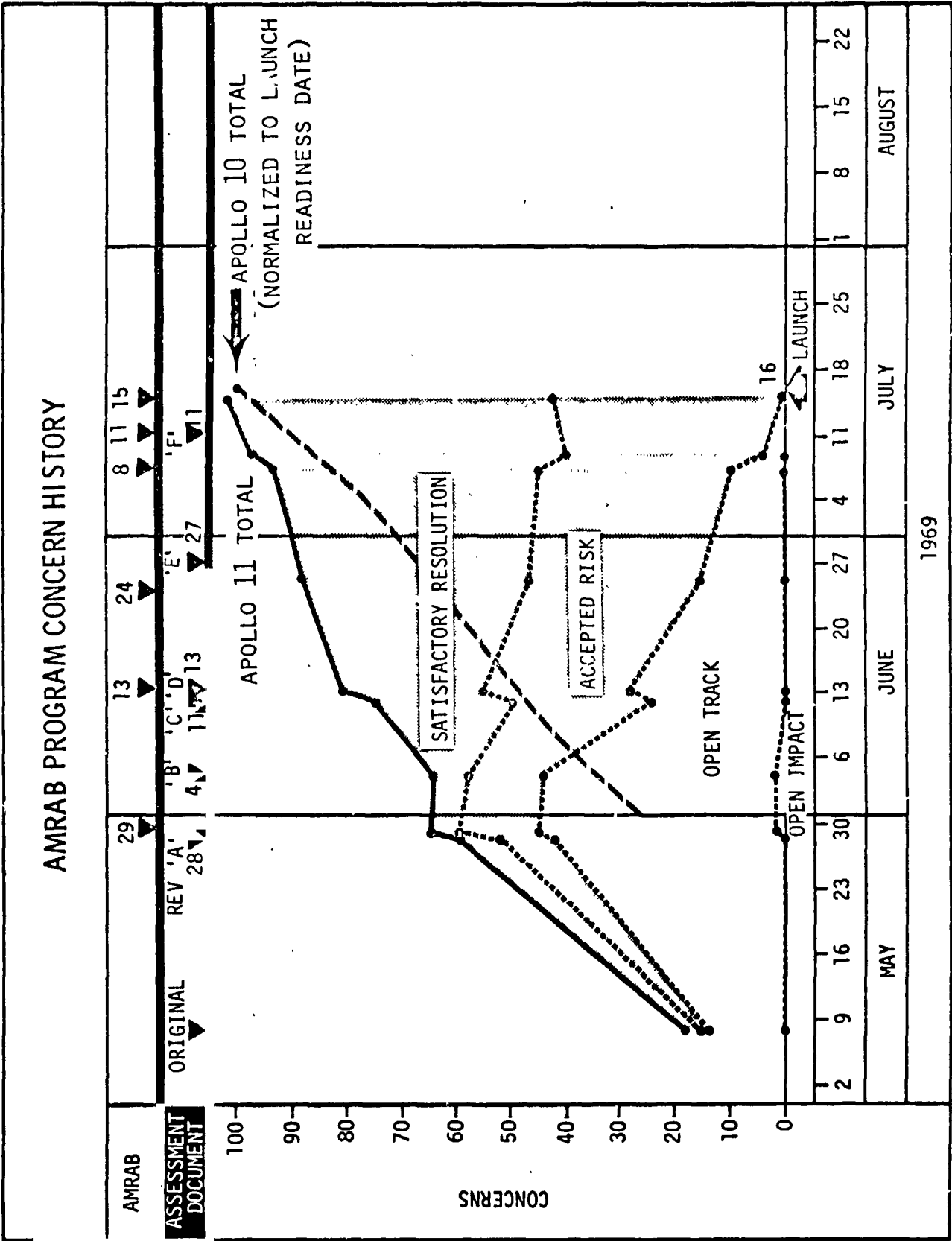


FIGURE 3-6

4.0 PROGRAM CONCERNS DATA BANK *

4.1 General

The Program Concerns Data Bank was developed to provide AMRAB and management at Apollo TIE locations with comprehensive, timely and uniform visibility with respect to program concerns. It is recognized that the design of the Data Bank is modest with respect to the state-of-the-art in data transmission, processing and display equipment and in the development of the required software programs. However, the operational implementation of the data bank, because of its diverse geographical and organizational relationships, posed important problems that had to be resolved prior to achieving the required level of acceptance and utilization.

4.2 System Requirements

Three fundamental characteristics were identified as critical to development of the bank. These were that design and implementation must be accomplished on a relatively short time schedule, that technical integrity of the data entered into the bank must be assured, and that response time must be flexible to meet the needs of a variety of users. On the basis of these characteristics, the following design requirements were identified:

1. A single data processing facility would be used for information storage and processing. The Boeing Huntsville Tele-services facilities were designated as this support facility.
2. Uniform input, retrieval and display formats would be used by all TIE locations.
3. Each TIE location would be responsible for identifying, tracking, updating and closing program concerns within their areas of responsibility.
4. A single source would be defined to control the design and implementation of the data bank.

In terms of data bank operation all TIE locations were given equal access to the Data Bank with respect to the data input and retrieval capabilities. No program concern data entered into the data bank were to be altered or deleted except by the originator. Program concerns that affected more than one TIE location

* Prepared by G. B. Rickey (Apollo TIE Data Bank Manager)

were appropriately coordinated by the respective locations and a responsible location defined. All open program concerns contained within the Data Bank were updated as changes/modifications dictated. However, the maximum period between updates was not to exceed seven days on a scheduled basis.

4.3 Concept Description

It was considered essential that a conceptual design of the total data bank be identified prior to development of hardware/software elements. Therefore, the initial effort was the documentation of the total data bank requirements containing all of the functional categories defined in the basic concept. Figures 4-1 and 4-2 summarize the approach used in defining and integrating the data element requirements derived from each functional organization at each TIE location. Organizational complexities required some compromise with respect to having clear, precise requirements identified that were common and thoroughly understood by all the remote terminal users. However, it is important to recognize that this effort provided a solid basis for the logical development of a complex data bank and it established the framework for a modular approach in the conceptual design phase that was compatible with the operating environment and utilized all appropriate available resources.

Figure 4-3 is a simplified conceptual diagram of the Data Bank. All Program Concerns are entered in a common master file using remote terminal access at each TIE location. The output is a coordinated reporting system with equal access by each TIE location in the indicated retrieval modes as individually required. Data bank discipline was maintained through control of the design, documentation, and operating procedures by the Washington, D.C. remote terminal station.

4.4 System Design

In the Data Bank there are two distinct operations normally required to enter data into the master file. The first is the collection of data and the second involves a data merge and master file update. The primary mode for initial entry of data into the bank is via an IBM 2740 typewriter located at each remote terminal (Figures 4-4 & 4-4 A). This equipment is connected to Data Phone lines that terminate into an IBM 2702 communications control unit located in Huntsville. A "data collection" software system, operating on a scheduled basis, receives data from the 2702 and stores it in disk file storage. Each remote terminal is assigned a disk file storage. Each remote terminal is assigned a disk file number and a key word for opening the file prior to data entry. In this manner each remote terminal

can access the file storage system at random intervals based on their individual requirements. This "data collection" mode does not process the input data in any manner but merely provides a collection service on a continuous scheduled basis. In addition, this operating mode has a cost advantage feature in that each user is only charged machine time during the interval when data is actually transferred between the communications buffer and the disk file. This data is transferred one line at a time from the 2740 and the resulting machine use even with a large number of line entries requires only seconds to store.

A back-up mode to the "data collection" system is the card-to-tape method where individual tapes are made at each remote terminal, transmitted to Huntsville via the communications terminal resulting in magnetic tape storage for subsequent merge and master file update.

In normal operation this first step is accomplished daily using the "data collection" mode schedule of 7:00 a.m. to 7:00 p.m. Therefore, all data into the collection system with respect to both initial concern input and updating of existing data can be accomplished during prime operating hours at random intervals based on individual user requirements.

The second step of merging all concern data from the remote terminals and then updating the master file is normally accomplished during second shift operations. Therefore, on a scheduled basis using batch processing procedures, a new master file is generated daily and is available for retrieval requests as required by each user.

Conventional input forms (Figures 4-5 and 4-6) have been developed for standard use at all remote terminals to facilitate the training and operational implementation of the data bank. All data output is based on individual user retrieval requests in one or a combination of the following retrieval fields:

1. Matrix Number
2. Date
3. Readiness
4. Vehicle
5. Location
6. Status
7. Effectivity
8. Houston Matrix
9. Flight Anomaly
10. AMRAB Category
11. Safety

The maximum number of retrievals that can be made in one run is 26. Special data sort retrieval software programs can be developed to satisfy unique retrieval requests.

Again, referring to Figure 4-4, the retrieval request procedure is different than the data input procedure. Because of limitations in the existing operational executive software programs, data retrieval requests are processed to Huntsville via a card-to-tape operation. Based on priority assignments these requests are then processed by the Central Processor Unit. A resulting retrieval tape is generated and transmitted via the communications control unit to the originating remote terminal. Here the remote terminal processor, model 30, receives the data and produces a tape that is subsequently connected to the line printer for final printout.

Figure 4-7 and 4-8 are samples of the concern data output format available for retrieval by each remote terminal. Figure 4-9 is a typical index sheet that is produced with every retrieval request. All data is presented on an 8 1/2 X 11 inch format as shown by these figures with suitable margin for conversion without change to book form. In addition, the quality of the hard copy is such that legible copies of the data may be produced using standard copy machines, the most significant characteristics represented by these output sheets are given by the following:

1. There are two basic parts to the output format; administrative and text data. The administrative data fields contain all of the information necessary to identify the technical concern by title, source, status, date, etc. The text data field begins with the description of the technical concern followed by the impact, action, status, assessment and recommendation.
2. A maximum of two pages is allocated for each concern.
3. Each of the text data fields are variable in length in order to allow flexibility in preparing the text material. However, the total text data field allowed is 68 lines with 68 characters per line.
4. The index page for each retrieval lists the page, ID, and matrix numbers, title, and status for each technical concern. In addition, preceding the title the letters A and R indicate an addition or revision respectfully with respect to the previous retrieval of those specific concerns. (This same characteristics is used on the individual lines within each technical concern text as appropriate.)

4.5 Operating Procedures

The procedures that are used to identify an item as a concern, for processing them for inclusion into the storage bank, for making revisions, changes and updating information, and for retrieving all or any portion of the data, is characterized by the flow diagram Figure 4-10. The most significant procedural characteristics reflected in this diagram are described as follows:

1. The data inputs as shown feeding into (1) implies that data from all sources appropriate to the Apollo program is used to identify a concern.
2. Decision blocks (2) and (3) indicate two levels of management review prior to a concern entry into the data bank. Within each TIE Center location the specific implementation of these filter points is determined by the local TIE Manager.
3. A uniform format block (4) is used throughout the system for submitting concerns to Teleservices for processing.
4. One approval is required for implementing a request for data retrieval as shown in decision block (5).
5. Data update, as shown in feedback loop (6), required management review and approval as indicated.

Using this procedural flow diagram as a base line, a top level management directive (Reference 6) was prepared defining the control authority for the design, implementation and the designation of responsibilities for each TIE Center. In response to this directive, individual TIE Centers prepared detailed operating procedures (Reference 7) for implementing the data system. As expected, the procedures for each Center were not identical due primarily to different organizational alignments. However, the relative deviations were not considered significant and did not compromise the implementation of the Data Bank.

4.6 System Implementation

The definition of Data Bank requirements, a description of the concept and design characteristics, and a defined set of operating procedures only provides the required technical base for the system to be implemented. Prior to implementation a formal program directive must be released to all affected organizations. However, it would be naive to assume that by this simple expedient implementation would automatically become a reality. Actually, in many respects the challenge of developing a data bank with the geographical and organizational environment associated with Apollo TIE is in its operational implementation.

Three basic problems were defined with respect to the implementation of the data bank. The solution to these problems required patience and technical understanding in order to cope with the many variable parameters involved. The first problem was the natural human resistance to change. Compounding this resistance was a general lack of understanding of how an EDP system operates which in turn resulted in an initial lack of confidence that the data bank would actually prove effective. Secondly, there were the many ramifications associated with the parochial attitudes of various functional organizations within and between each TIE location with respect to releasing data into the Data Bank. There were suspicions regarding the use of data by "outside" management, fear of criticism regarding the adequacy or accuracy of the data, and concern relative to the definition of responsibilities in those gray areas of authority between TIE locations. The third problem related to the development of the integrity preserve this integrity. Integrity as used in this context is defined as requiring both accurate information with respect to the identification and supporting evidence, and that the data is timely and current with respect to the time that the data is being reviewed and assessment made.

Initial skepticism and resistance to implementation of the Data Bank was markedly reduced by making available for wide distribution two key elements. These were design specifications and an actual sample of a Data Bank retrieval. The sample output provided a strong communication media that helped define format characteristics in addition to providing assurance of the operational capabilities of the Data Bank.

The problem of reducing the fears and parochial attitudes of the affected organizations could only be accomplished over a period of time during which mutual honesty, faith, and confidence among these organizations was developed. In developing these relationships it was essential that certain operating characteristics be strictly adhered to such as: (1) no program concern data entered into the Data Bank could be altered or deleted except by the originator, (2) all TIE locations must have equal access to the Data Bank, (3) each TIE location has the responsibility for identifying, tracking, updating and closing each concern within its respective Apollo program areas of responsibility, and for properly and promptly coordinating any conflicts for subsequent resolution, (4) a single source for documentation and design control, and (5) a reasonable understanding between TIE location on how the data retrieved from the Data Bank will be used. No deviations from these characteristics were tolerated except those approved by all affected organizations.

The problem of ensuring that all the data being entered into the bank was of the highest possible integrity involved every aspect of the design and implementation of the Data Bank. However the ultimate solution to this problem was in the degree of personal motivation that could be developed. The specific elements of

the Data Bank system that were directed toward developing a high degree of motivation included the following:

- 1) Considerable emphasis was placed on the importance of the assessments to be made with respect to both the Apollo program and the reputation of The Boeing Company. In this regard it was noted that AMRAB would use the Data Bank as a prime source of data to be used in these assessments.
- 2) One of the major problems encountered in performing assessments was the availability of relatively large amounts of data that were not identified with a single source or positive evidence of its current validity. Therefore, using the philosophy of going as close to the source of potential concerns as possible, appropriate responsibility was placed on each TIE location for the identification, tracking and status assessment of these concerns within their areas of responsibility. In addition, within each TIE location, specific individual assignments, by name and organization, were included with each concern that was entered into the Data Bank. The obvious intent in this procedure was to acquire the highest level of integrity through motivation of individuals to accept the responsibilities and recognition of providing data from a single source that was to be used in making technical assessments by several levels of management culminating in an official Boeing report to NASA.
- 3) Further motivation efforts were directed toward emphasizing the inherent characteristics of the Data Bank concept as being the most effective means of providing the required discipline to support assessments. This discipline was reflected in many ways, including:
 - a) clear concise concern statements that could be understood by a variety of reviewers,
 - b) exact duplicate of all data at all remote terminals with respect to content and format,
 - c) consistent operational procedures,
 - d) a system that is most unforgiving if errors are retained.

In working toward an effective solution of these implementation problems it can be seen that many complex variables were involved. Within this particular operating environment it would be a fallacy to expect any short-cut alternatives. As indicated previously, in many respects the implementation of the Data Bank represented the real challenge. Effective utilization can only be obtained through dedication to purpose, being responsive to valid user requirements, and producing a cost effective product on schedule that meets the system specifications.

PROGRAM CONCERN DATA BANK CONCEPT

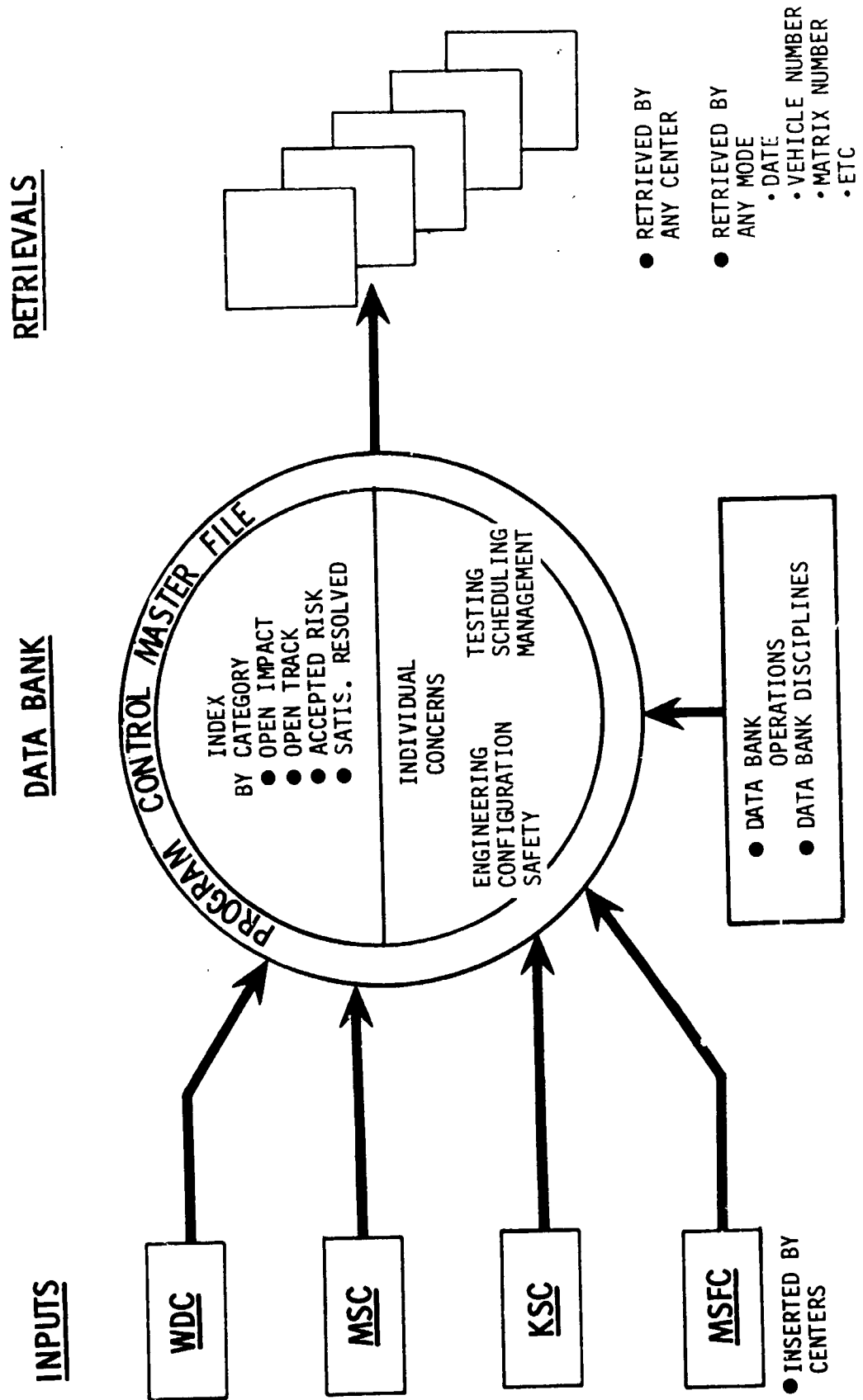
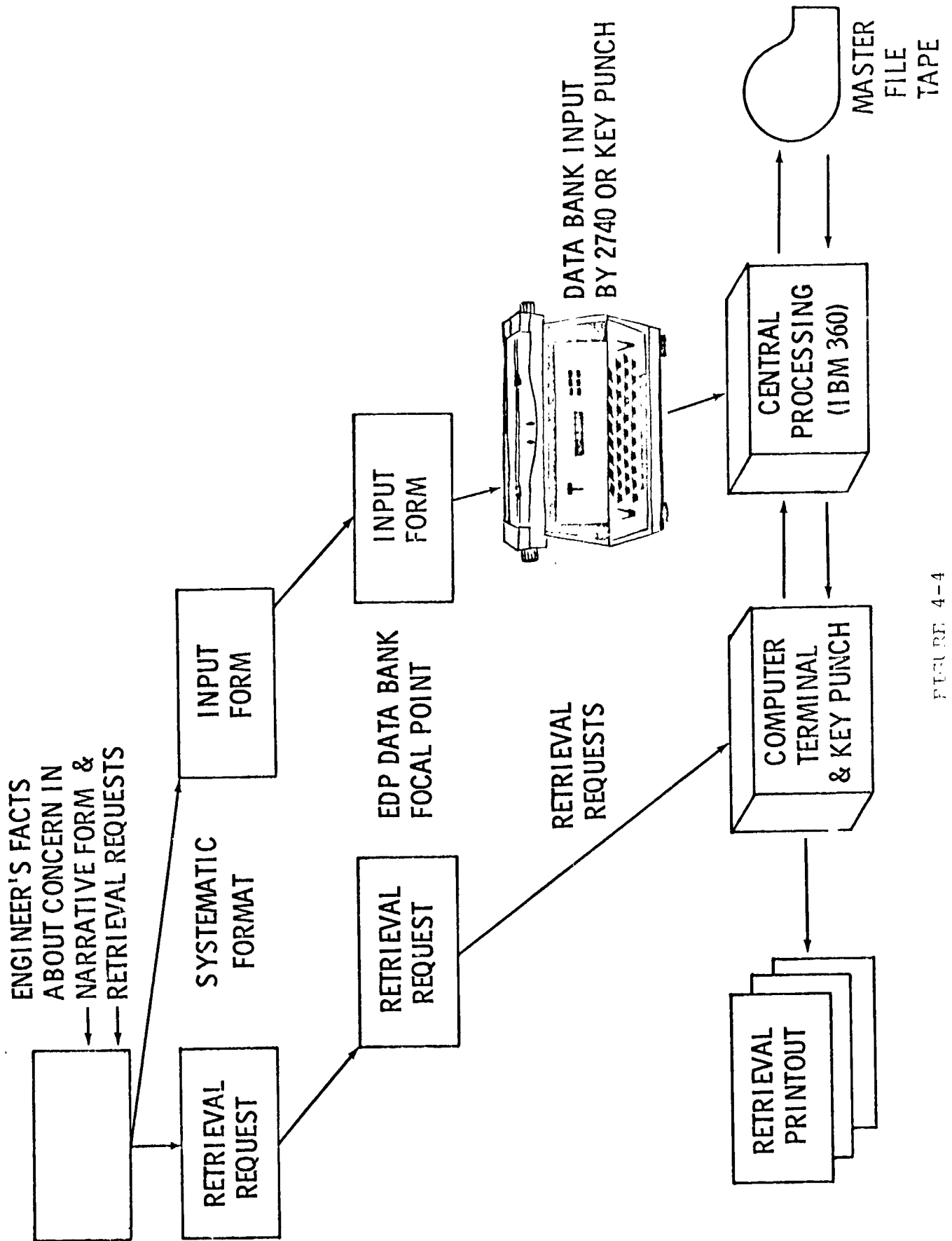


FIGURE 4-3

INPUT AND RETEVAL METHOD



FILED 4-4

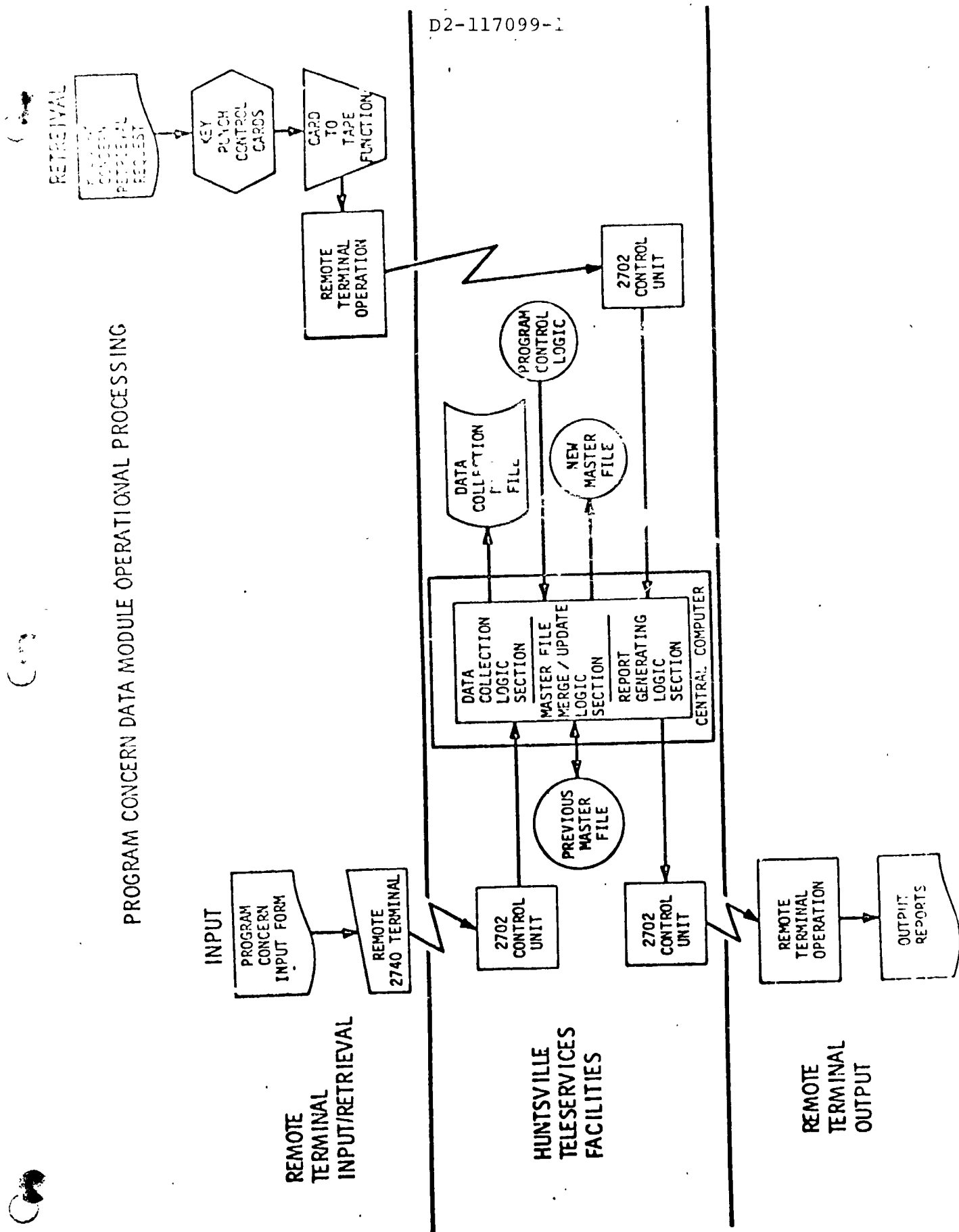


FIGURE 4-4 A

[illegible]

INPUT RECORD NUMBERS	AMRAS CATEGORY	DESCRIPTION
04	IMPACT	
06	ACTION	
10	STATUS	
11	ASSESSMENT	
12	RECOMMENDATION	

DOC 1173 REV. 3-69
2520

FIGURE 4-5

PROGRAM CONCERN INPUT SHEET #2

[illegible]

06	AMRAB CATEGORY
07	DESCRIPTION
08	IMPACT
09	ACTION
10	STATUS
11	ASSESSMENT
12	RECOMMENDATION

DOC 11774 REV. 3-69

FIGURE 4-6

IC. 5C440D2 TITLE - STRESS CORROSION DATE 11/01/69

HCLSTCN NC. P127 MATRIX NC. 02-02-03.01.C1 EFFECTIVITY LM-3 SAFETY

SYSTEM VEHICLE DESIGN AND INTEGRATION STATUS CLOSED REV. CODE E (01/28/69)

SUBSYSTEM PRIMARY STRUCTURES ORGANIZATION 5-2740 FLIGHT ANOMALY

BY R. M. HAYNES 488-0910 X227 READINESS ASSESSMENT - ACCEPT RISK FOR AS-504

REFERENCE SOURCE - LM-3 DCR HELD IN MARCH OF 1968

APRAB CATEGORY OPEN FAILURE REPORTS

DESCRIPTION

INSPECTION OF LM-3 AND LTA-3 REVEALED STRESS CORROSION AND CRACKING OF STRUCTURAL MEMBERS. A 1-1/2 CRACK WAS FOUND IN THE SPLICE FITTING ON THE -227 BULKHEAD OF LM-3 DURING A SCHEDULED INSPECTION. GOX TANK SUPPORT FITTING WAS FOUND CRACKED IN PREDICTED MANNER ON LM-3 & LM-6. A/S-CABIN-DEAD FACE FITTING WAS FOUND CRACKED ON LTA-8 & A/S-MID SECT-ENGINE BAY-L.H.SHIELD-LCHWR FITTING WAS ALSO FOUND CRACKED ON THE QUAL. TEST VEHICLE. ALL THREE PARTS APPEAR ON THE CRITICAL PART LIST OF DEC. 1968 SURVEY. THESE CRACKED PARTS WERE DISCOVERED DURING THE SPECIAL CRITICAL PART INSPECTION IN JANUARY 1969.

IMPACT LOSS OF MISSION OBJECTIVES, IF CRITICAL MEMBER FAILS IN FLIGHT.

ACTION A FIX WAS MADE TO THE -227 BULKHEAD. NASA WILL ACT ON GAEC RECOMMENDATION RESULTING FROM DECEMBER 1968 STRESS CORROSION REVIEW AND SUBSEQUENT TEST AND FLIGHT VEHICLE INSPECTIONS. GOX TANK SUPPORT FITTING WAS REPLACED IN LM-3 AND LM-6 (7075-173) FRONT FACE BEAM SPLICE, REPLACED ON LM-3 AND SUBS (7075-173). THE A/S CABIN-DEAD FACE FITTING AND THE A/S MID SECTION ENGINE BAY HEAT SHIELD FITTING WERE INSPECTED ON LM-3 AND WERE NOT CRACKED.

STATUS

GAEC HAS IDENTIFIED 38 TYPES OF PARTS (50 PARTS ON LM-3) WHICH ARE SUBJECT TO STRESS CORROSION, AND ARE CRITICAL (FACTOR OF SAFETY 1.5 IN PROBABLE CRACKED CONDITION). THESE TYPES OF PARTS WERE INSPECTED ON LM-2, LTA-3, AND LTA-3 D/R BY REMOVAL AND PENETRANT INSPECTION, AND WERE INSPECTED IN PLACE ON LM-3, LM-4, LM-5, LM-6, LM-7 AND LM-8 AND QUAL. TEST VEHICLE AS OF 1-13-69. 14 PARTS WERE INSPECTED ON LM-3. A TOTAL OF FIVE CRITICAL PARTS WERE FOUND CRACKED DURING THIS INSPECTION. MSC FRB BOARD ACCEPTED GAEC RATIONALE FOR PROBLEM CLOSURE ON JAN 24, 1969.

ID-504402 TITLE - STRESS CORROSION DATE 11/01/68
 HCLSTCN NO. P127 MATRIX NO. C2-02-03-01-01 REV. CODE E (01/28/69) (CONTINUED)

ASSESSMENT COMPLETION OF THE INSPECTION AND REPLACEMENT OF THE DEFECTIVE PARTS
 SHOULD RESOLVE THIS PROBLEM. MSC FRR POSITION IS CONSIDERED
 ACCEPTABLE

RECOMMENDATION TO OBTAIN ADDED CONFIDENCE, GAEC SHOULD BE REQUESTED TO FORMALLY
 DOCUMENT IN ONE REPORT ALL INFORMATION RELATIVE TO THE STRESS
 CORROSION PROBLEM INCLUDING INSPECTION HISTORY REPAIR OR REPLACEMENT
 ACTIONS AND THE GAEC FORMAL POSITION ON LM-3. THIS SHOULD BE
 COMPLETE PRIOR TO THE PDFRR.

D2-117099-1

SAMPLE - CONCERN DATA OUTPUT
 FIGURE 4-8

SAMPLE LUNAR MODULE CONCERNS INDEX

OPEN IMPACT	NONE
OPEN TRACK	<p>WATER REGULATOR FAILURE</p> <p>LM STEERABLE ANTENNA SOLDER JOINT CRACK</p> <p>PQGS</p> <p>FUEL & OXIDIZER BURST DISK C/O FAILURE</p> <p>LANDING GEAR THERMAL PROTECTION</p> <p>LANDING RADAR FALSE LOCK ON</p> <p>LM GUIDANCE SWITCH ANOMALY</p>
ACCEPTED RISK	<p>SHE TANK BURST DISK</p> <p>SUIT PRESSURE METER ANOMALY</p> <p>PRIMARY HELIUM REG FAILURE</p> <p>PRESSURE VESSEL INTEGRITY</p> <p>RANGE/RANGE RATE METER FAILURE</p>
SATISFACTORY RESOLUTION	<p>DOWN-FIRING RCS JET DAMAGE D/S INSULATION ON LUNAR LANDING</p> <p>MISSION 'G' PROPULSION TEST</p> <p>LGC/RADAR INTERFACE</p> <p>EXPLOSIVE SQUIB VALVE LEAK</p> <p>BATTERY LOAD SHARING</p> <p>WQMD</p> <p>A/S PROPELLANT LINE TEST FAILURE</p>

FIGURE 4-9

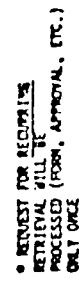


FIGURE 4-10

5.0 WORK ADMINISTRATION SYSTEM

5.1 Scope

The WDC-TIE Work Administration System was implemented at Washington, D. C., to maintain visibility and control of NASw-1650 Contract deliverables generated by broad work statements coupled with detailed specific tasks, and supplemented by Task Directives and communication from a diverse number of NASA Apollo Program task directors. Specifically, the system is used to:

- 1) Provide management visibility and control in terms of end item packages, schedule progress, and deliveries.
- 2) Assign tasks to individual responsible managers.
- 3) Provide a record of how and when a task is originated and a record of response to technical direction.
- 4) Serve as a baseline between Boeing task managers and NASA task directors.

5.2 Key Elements

Key elements of the Work Administration System are listed below:

- 1) Command Media - policy directives, procedures, and instructions
- 2) Technical Directives
- 3) Technical Direction Acknowledgements
- 4) Task Activity Record Sheets (TARS)
- 5) TAR Review Meetings
- 6) Activity Records Documentation (Reference 8 and 9).
- 7) Document Information Records (DIR)

5.3 System Flow

Figure 5-1 shows a simplified version of the work flow. The initial impetus is given in the statement of work in NASA Contract NASw-1650. Additional impetus is given in Technical Directives (TD's) issued as required by the NASA APO-TIE Task Directors and Technical Director. Boeing WDC-TIE issues Program Directive - Operations to give authority to the functional organization to proceed on the assigned tasks. Technical Direction Acknowledgement (TDA) forms are prepared by WDC-TIE task managers in response to Technical Directives (TD) from the customer. These forms (1) acknowledge the receipt of a TD to

the APO-TIE Technical Director, (2) assign action responsibility to a Boeing Task Manager, and (3) inform the issuing TIE Task Director of the immediate course of action to be taken by the WDC-TIE work force.

After the aforementioned transactions have occurred, a Task Activity Record (TAR) (Figure 5-2) is prepared which identifies, schedules, and reports against the programmed activities. The TAR is the primary vehicle utilized by the in-house Boeing organizations for control and the supervision of the tasks involved. Task Activity Schedules (Figure 5-3) summarize TAR milestone information.

Periodic Management Reviews are conducted and chaired by Program Integration in the Management Information Center. The three rear-projection viewing screens are used to display Task Activity Records (TARs) and backup material. All organization managers and task managers attend the meetings to highlight current activities displayed on their TARs. Potential and real problem areas are discussed and resolutions are determined. This type review assures management attention, control, and necessary action required to assure satisfactory accomplishments of assigned tasks and rapid feedback of corrections to the TAR's when required.

Results of the periodic TAR's reviews are recorded in Boeing Document D2-117067-1, "Activity Record Document, WDC-TIE" (Figure 5-4). Action items, redirection and due dates are assigned at the management review. Task Activity Records that have been completed, cancelled, deleted, combined, or otherwise inactivated are placed in D2-117067-2, the "Activity Record Historical Document".

The accomplishment of delivered end items is validated by Document Information Records (DIR's) or memo to the customer transmitting the end items required (CDRL, reports, etc.).

The Command Media described below is included in Appendix A.

- 1) Management Directive WDC 500.8 "Apollo TIE Work Administration-Washington, D. C.". This directive assigns the actions and responsibilities required by Washington, D. C. Organizations to implement the work administration system.
- 2) Operating Procedure WDC 500.10 "Work Administration Procedure Apollo-TIE-Washington, D. C." This procedure describes the system prescribed by the management directive in (1) above to provide work authorization, status and transmittal of WDC-TIE deliverable items to NASA/APO.

- 3) Operating Procedure WDC 500.13 "Task Activity Records, Apollo TIE-Washington, D. C.". This procedure describes the system to provide in-house work administration visibility and control for WDC-TIE effort. It contains detailed instructions for completing TAR forms.
- 4) Operating Procedure WDC 710.3 "Processing of NASA Technical Directives". This procedure amplifies the requirements of Operating Procedure WDC 500.10 for the processing of Technical Directives received from the customer and establishes the requirement and system for the preparation and coordination of the Technical Direction Acknowledgement (TDA) form to be sent in response to TD's.
- 5) Management Directive WDC 515.1 "Correspondence Approval Routing, Signature Authority, and APO Interfaces, Washington, D. C.". This directive establishes a uniform approval routing and signature approval policy and clarifies NASA/Boeing interfaces which are not contract task oriented.
- 6) Office Instruction WDC 206 "Preparation of Document Information Record". This instruction gives direction for processing the Document Information Record (DIR). The purpose of the DIR is to provide a simple mechanism to effect transmittal of a CDRL item and for notifying all affected parties that a CDRL delivery has been made.

5.4 Conclusions

Since its inception the Work Administration System has governed and recorded the initiation and completion of approximately 180 task activities. In its fully developed form it has been very satisfactory for the TIE Contract. It is a simple, inexpensive method which gives Boeing firm control of work force activities and priorities while informing NASA counterparts and management of task progress and emphasis. Its success is due to strong management support and use.

WDC-TIE WORK ADMINISTRATION SYSTEM

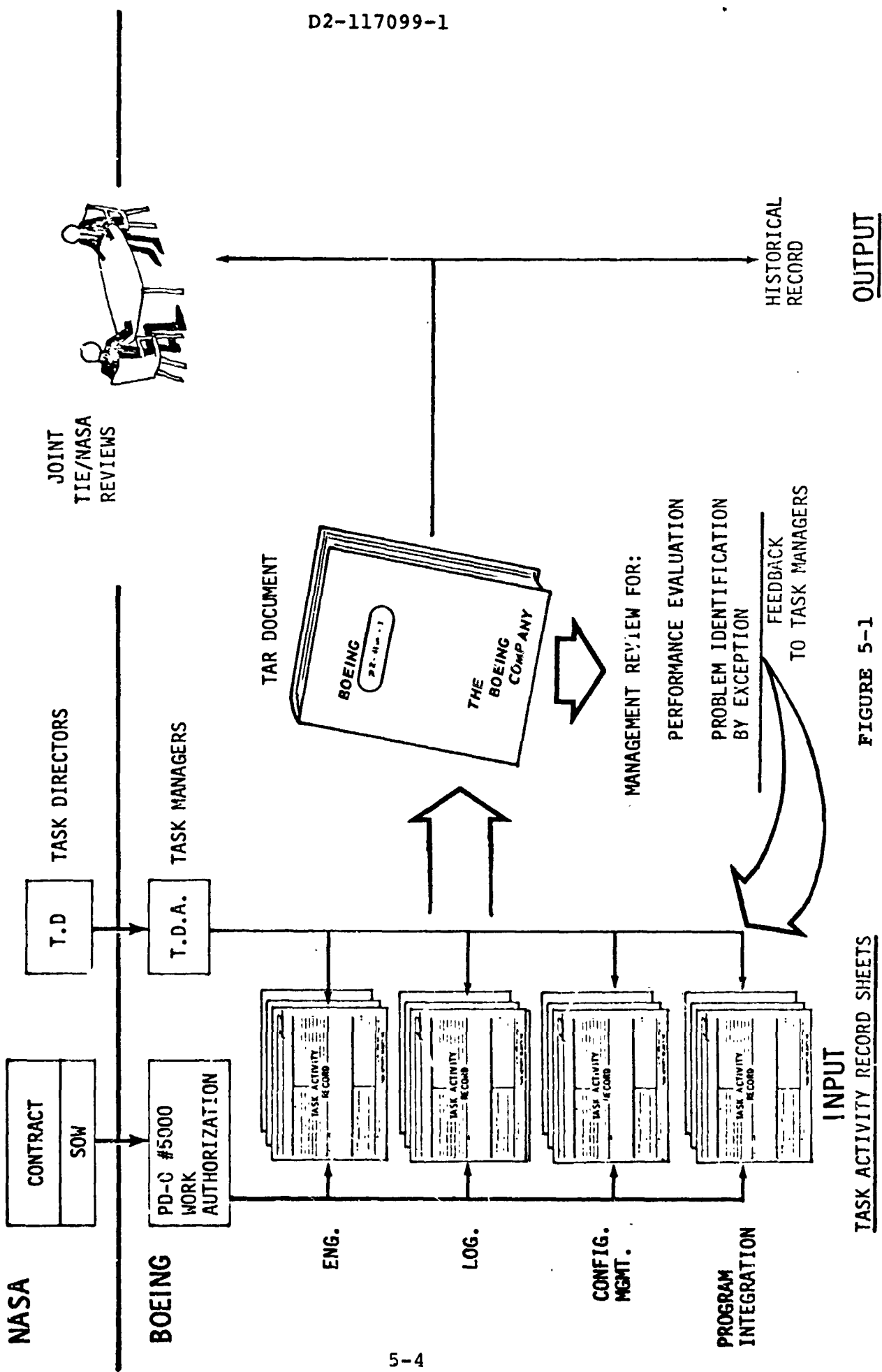

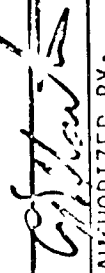


FIGURE 5-1

INPUT TASK ACTIVITY RECORD SHEETS

SAMPLE TAR

		TITLE: ENGINEERING CHANGE EVALUATION		 AUTHORIZED BY:	
DESCRIPTION: Evaluate APO-CCB (Level I) changes and prepare engineering briefs and recommendations for the TIE Level I CCB representative as required in support of TAR 415. Evaluate MSF Center changes and prepare engineering briefs and recommendations for WDC-TIE Change Management and MAP-6 as required in support of TAR 422. Identify and review changes to selected critical space vehicle functions.					
SCHFD EVENT OR DELIVERY	SCHED.	ECD.	SCHED EVENT OR DELIVERY	SCHED.	ECD.
D2-117089-1, CHANGE			EVALUATION OF CENTER	WEEKLY AS	
REVIEW PLAN - INADVERTENT			CHANGES	REQUIRED	
L/V ENGINE SHUTDOWN	4/3/69	4/14/69A	EVALUATION OF LEVEL I	WEEKLY AS	
CHANGE REVIEW PROCEDURE	4/15/69	4/15/69A	CHANGES	REQUIRED	
STATUS REMARKS: 1) CRITICAL FUNCTIONS IDENTIFIED: L/V INADVERTENT SHUTDOWN; S/V GUIDANCE; S/V EDS; S/V STRUCTURE. 2) EVALUATED AND CONCURRED WITH 11 MSF CENTER CHANGES DURING PERIOD OF 6/1-17/69.					
WDC RESPONSIBLE MGR. <u>R. L. CAMPBELL</u> SUPPORT <u>ALL TIE ENGINEERING ORGANIZATIONS</u>			APO INTERFACE <u>C. C. GAY/C. H. KING</u> CATEGORY <u>ASSESSMENT</u> AUTH. <u>CONTRACT SOW/PDO 5000</u>		
SOW PARA. <u>2.3</u>			INITIATED <u>7/67</u>		

STATUS AS OF: 6/19/69

TASK 2 ENGINEERING EVALUATION

TASK ACTIVITY RECORD NO. 210

TASK 2		ENGINEERING EVALUATION		1969 TASK ACTIVITY SCHEDULE												WDC	
TAR	LOW	BELTHERIES	ACTIVITY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
210	7.3	1968	ENGINEERING CHANGE EVALUATION (PDO - 5000)														
225	2.1		APOLLO SATURN SYSTEM STRUCTURAL ASSESSMENT (CDRL A004/12) (CDRL A004/34) (TD-46 COMPLETED)														
235	2.1		ANALYSIS OF TEST PROJECT ENGINEERING REPORTS (TPER'S) (TD-485)														
242	2.1		TRENDS ANALYSIS OF VIBRATION INDUCED S/C FAILURES (TD-43, ITEM 3)														
243	2.2		S/N WEIGHTS MANAGEMENT SYSTEM (PDO 5000)														

STATUS AS OF 6/19/69

ENGINEERING EVALUATION

ACTIVITY

POTENTIAL LINE 1968

POTENTIAL LINE 1969

POTENTIAL LINE 1970

POTENTIAL LINE 1971

POTENTIAL LINE 1972

POTENTIAL LINE 1973

POTENTIAL LINE 1974

POTENTIAL LINE 1975

POTENTIAL LINE 1976

POTENTIAL LINE 1977

POTENTIAL LINE 1978

POTENTIAL LINE 1979

POTENTIAL LINE 1980

POTENTIAL LINE 1981

POTENTIAL LINE 1982

POTENTIAL LINE 1983

POTENTIAL LINE 1984

POTENTIAL LINE 1985

POTENTIAL LINE 1986

POTENTIAL LINE 1987

POTENTIAL LINE 1988

POTENTIAL LINE 1989

POTENTIAL LINE 1990

POTENTIAL LINE 1991

POTENTIAL LINE 1992

POTENTIAL LINE 1993

POTENTIAL LINE 1994

POTENTIAL LINE 1995

POTENTIAL LINE 1996

POTENTIAL LINE 1997

POTENTIAL LINE 1998

POTENTIAL LINE 1999

POTENTIAL LINE 2000

ACTIVITY RECORD DOCUMENT

SCHEDULES
(BY TASK)

TASK
ACTIVITY
RECORDS
(TAR's)

APO EMPHASIS LIST

ACTIVITY SUMMARY (WDC) ADDITIONS,
COMPLETIONS, DELIVERIES

FIGURE 5-4

DELIVERIES (ALL LOCATIONS)

6.0 SUMMARY

The management techniques described in this document have a record of successful and effective use. Although developed for the Apollo Program, they have a potential application to other programs.

Teleservices provided the rapid communications and conferencing techniques necessary for such a large scale program, involving a number of different geographic locations. It made possible complete management participation in decision making, and allowed timely consideration of data available in widely spread locations.

The Apollo Mission Readiness Assessment Board (AMRAB) placed top managerial and technical talent in a regular group review and approval cycle in order to better assess mission readiness, develop company positions, and to inform the customer of its findings.

The Program Concern Data Bank provided a single, central source for the uniform identification, monitoring and classification of program concerns by all locations on a timely basis,

The WDC-TIE Administration System provided a simple but effective means for providing visibility and control over the various task activities of WDC-TIE.

Aerospace Group

COMMITTEE DESCRIPTION

SUBJECT: APOLLO MISSION READINESS
ASSESSMENT BOARD

February 14, 1969
Supersedes October, 1968
Issue

 2/14/69

George H. Stoner
Group Vice President -
Aerospace

I. FUNCTION AND SCOPE

The Boeing Company must conduct an Apollo Mission Readiness Assessment in accordance with the scope of work defined in Contracts NASW-1650 and NAS8-5608, Schedule IV. The scope of this activity is as quoted below:

A. Contract NASW-1650, Article 2, Scope of Work

"The purpose of this contract is to assist NASA in identifying Apollo/Saturn problems, and arriving at solutions to such problems, the resolution of which is mandatory to approve the readiness for the mission of the integrated space vehicle. In order to accomplish this purpose, the Contractor shall provide: (a) an overall Apollo-wide systems integration and evaluation capability in support of the Apollo Program Director and (b) engineering and other assistance at the Center program level to meet needs that exist for systems integration; both within the areas described in Exhibit A and in a manner to assure continuity and uniformity of effort."

B. Contract NASW-1650, Exhibit A, General

"1. The Contractor shall perform Technical Integration and Evaluation (TIE) tasks, as defined herein and under Contract NAS8-5608, Schedule IV, to assist NASA Apollo organizations in the technical management and assessment of the Apollo Program."

(Contract paragraphs covering administrative and procedural details are not quoted.)

"6. The Contractor will advise NASA of deficiencies in work content or application of resources which could lead to undesirable program impact. Preliminary work required to identify such areas will be carried out at the Contractor's initiative. NASA is to be advised of Contractor-initiated work in accordance with local procedures."

Accordingly, the Apollo Mission Readiness Assessment Board (AMRAB) is chartered to examine the activities of The Boeing Company leading to an assessment of flight readiness for each Apollo mission. The Board will initiate/review and monitor any necessary actions to achieve a sound mission readiness assessment and assure maximum effectiveness of The Boeing Company's overall TIE participation in the Apollo Program.

II. RESPONSIBILITIES

- A. The Board will monitor the status of all planned assessment activities that must be completed prior to flight readiness assessment transmittals to the customer for each Apollo mission. The Board will initiate through its members any necessary corrective action within The Boeing Company, where the data reviewed indicates such action to be necessary. Two mission assessment reports will be transmitted to the Apollo Program Director prior to each flight. A preliminary report will be transmitted to the customer prior to the Flight Readiness Review and the final assessment report will be forwarded following the customer's Flight Readiness Review.
- B. The Board Chairman will submit the reports which will be a group consensus of the membership of the Board, for review and approval, together with the letter of transmittal to the Apollo Program Director, by the Aerospace Systems Division Vice President - General Manager. Minority opinions, should they exist, will be reported to the Aerospace Systems Division Vice President - General Manager. Upon his approval, the Board Secretary will prepare the preliminary and final summary assessment reports validating the Company's position for transmittal to the Apollo Program Director to serve as a basis for assessment support to the customer's readiness reviews.

The Board Chairman will submit the reports, the approved letter of transmittal, and the description of the significant Accepted Risks to the Group Vice President - Aerospace.

- C. The Board Chairman will call to the attention of the Aerospace Systems Division Vice President - General Manager significant Accepted Risks which may be included in the assessed data.

III. MEMBERSHIP

The Apollo TIE Manager will act as Chairman of the Board and will have the authority to appoint members to the Board from any Aerospace Group organization as may be necessary to accomplish the Board's function. Permanent members of the Board are as follows:

MEMBERSHIP

Apollo TIE Manager	- C. A. Wilkinson Chairman
Southeast Division General Manager	- H. J. McClellan Deputy Chairman
Huntsville Manager	- F. B. Williams
Boeing Atlantic Test Center Director	- F. L. Coenen
Aerospace Systems Division - Washington, D.C. Manager	- C. P. Martin

III. (Continued)

MEMBERSHIP

Houston Manager	- T. M. Davidson
KSC Apollo TIE Manager	- R. L. Brock
Deputy Manager - Saturn	- J. B. Winch
Program Integration Manager	- J. M. Barker
	Secretary
	(Non-Voting Member)

PROFESSIONAL MEMBERS

Engineering	- R. L. Campbell
Test	- D. L. Morehead
Safety	- R. B. McMurdo
Configuration Management and Interface Engineering	- E. K. Cooper

The Deputy Chairman of the Board can act for the Chairman in any respect at his request and in the absence of the Chairman is expected to assume the full duties.

The KSC Apollo TIE Manager, the Deputy Manager - Saturn, and the operating arm manager for Washington, D. C., Huntsville, DATC, and Houston are included on the Board so that they may provide the full understanding and response within their respective organizations to achieve a meaningful Apollo management readiness assessment for each flight.

The Board members for Engineering, Test, Safety, and Configuration Management and Interface Engineering are professionally responsible for the effectiveness of their assigned functions relating to flight readiness assessment, and have the authority to initiate necessary corrective action anywhere within the Aerospace Group through established line management channels. Each is charged with the responsibility for maintaining a close relationship to each TIE manager in his professional area and with other members of the Board. His contacts with the NASA Apollo organization and its other contractors will be carefully pre-coordinated with the pertinent Operating Arm Managers and their appropriate subordinates. Specific assignments for the four Board members are as follows:

The Board member for Engineering carries the functional responsibility for establishment of the Engineering portion of an overall assessment plan in an up-to-date documented form. He is responsible for the definition and execution of assessment and review methods in accord with good practice and for the adequacy of the technical content.

The Board member for Test carries the functional responsibility for establishment of the Test portion of an overall assessment plan in an up-to-date documented form. He is responsible for the definition and execution of assessment and review methods in accord with good practice and for the adequacy of the technical content. He exercises this functional responsibility in all TIE areas with Test review, assessment and planning assignments. He will assure that the Apollo Mission Plans contain the best practical approach to a Test Plan that will assure the launch of vehicles which meet their documented requirements.

III. (Continued)

The Board member for Configuration Management and Interface Engineering carries the functional responsibility for establishment of the Configuration Management and Interface Engineering portion of an overall assessment plan in an up-to-date documented form. He is responsible for the definition and execution of assessment and review methods in accord with good practice and for the adequacy of the technical content. He exercises this functional responsibility in all TIE areas with Configuration Management and Interface Engineering review, assessment and planning assignments. He will assure that the Apollo Mission Plans contain the best practical approach to a Configuration Management and Interface Engineering Plan that will assure the launch of vehicles which meet their documented requirements.

The Board member for Safety carries the functional responsibility for establishment of the Safety portion of an overall assessment plan in an up-to-date documented form. He is responsible for the establishment of a TIE Safety program which contains the essential elements of System Safety. He is responsible in a professional sense for the adequacy of the effort performed in accordance with the TIE Safety Program.

The Board member for Program Integration will be a non-voting Board member and perform as Board Secretary. Program Integration has the responsibility to integrate the plans supplied by the location managers and be responsible for the documentation of an overall Apollo Mission Assessment Plan for submittal to the Board. He must maintain this overall assessment plan in an up-to-date documented form. The Program Integration member will also be responsible for integrating program activities between Centers and to integrate all mission data for submission to the Board. The Program Integration member will prepare the integrated assessment reports for the Board. A Readiness Assessment Manager (RAM) will be appointed by the Apollo Mission Readiness Assessment Board Chairman for each Apollo mission. The Readiness Assessment Manager will work through the Program Integration Board member when performing his assigned mission responsibilities.

File behind ASG Committee Description
divider in the Organization Manual.

SPACE DIVISION

APOLLO TIE
MANAGEMENT DIRECTIVE

470.1

SUBJECT: PROGRAM CONCERNS DATA BANK

October 8, 1968

TO: ALL APOLLO TIE LOCATIONS

REFERENCE: Document D2-117066-2,
"Program Concern Data
Bank System Specification"FROM: *C. A. Wilkinson*
C. A. WILKINSON
ASSISTANT DIVISION
MANAGER - APOLLO TIE

I. PURPOSE

To develop and implement a system for storing in the Huntsville computer storage bank, data pertaining to the program concerns which become identified in connection with each successive launch in the Apollo Program.

II. OBJECTIVE

To provide management at TIE Centers and NASA with comprehensive, timely and uniform visibility with respect to such program concerns, prompt retrieving capability and to effect an economy of effort.

III. SCOPE

The system provides the means for all TIE Center to:

- A. Include within a common storage bank individual items of information considered to constitute a program concern.
- B. Feed into the storage bank revisions, updating information and changes in status, as required.
- C. Retrieve, as required, the complete package of stored data or any portion of it, including individual items.
- D. Have on call a history of events connected with each launch, coded by user requirements.
- E. Identify areas of possible concern through correlation between the parameters of individual problems.

IV. PROCEDURES

The procedures to be used to identify an item as a program concern, for processing them for inclusion into the storage bank, for making revisions, changes and updating information, and for retrieving all or any portion of the data will be in accordance with those described in reference A.

V. AUTHORITY

APO-TIE will control, manage and administer the system. The authority for establishing the identity of an item as a program concern, for approving its inclusion into the storage bank, for feeding revisions and changes and for approving retrievals are vested in the managers of each TIE location or their designated representatives.

VI. RESPONSIBILITIES

A. Each TIE location will be responsible for:

1. Identifying an item as a program concern through review and assessment by TIE management.
2. Developing schedules and assigning action to perform assessment of each item.
3. Reviewing the data as required for inclusion into the common TIE bank.
4. Designating the persons within management vested with authority to approve inclusion of items and revisions into the storage bank, and for retrieving total package or any part thereof.
5. Determining the disposition of each item including continuation of status as a concern, closure, deletion from bank or retention in closed status for use as reference for subsequent launches.
6. Publishing command media to support this directive, and establishing the methods for processing inputs into, and obtaining retrievals from the storage bank.

B. In addition to those responsibilities described in Section VI.A above, Washington, D.C. - TIE will:

1. Document the entire system as appropriate, (reference A).
2. Develop, document and maintain software for the computer program.

AEROSPACE
SYSTEMS DIVISION

OPERATING PROCEDURE

WDC 470.2

SUBJECT: PROGRAM CONCERNS DATA BANK - April 21, 1969
ADMINISTRATION OF -
WASHINGTON, D. C.

TO: ALL WASHINGTON, D. C.
ORGANIZATIONS

FROM: *C. E. Martin*
C. E. MARTIN
WASHINGTON, D. C.
MANAGER

REFERENCE: (A) APOLLO TIE MANAGEMENT DIRECTIVE 470.1,
"PROGRAM CONCERNS DATA BANK"
(B) D2-117066-2, "PROGRAM CONCERN DATA
BANK SYSTEM SPECIFICATIONS",
Rev. A dated 1-13-69

I. PURPOSE

This procedure implements the Washington, D. C. portion of the Program Concerns Data Bank System, assigns responsibilities, and defines requirements necessary to support the reference A directive. Program concerns identified and stored in the data bank, by WDC-TIE and other TIE Centers, shall be used to facilitate and enhance the management function of program review and technical assessments. Activities identified to date include: Apollo Mission Readiness Assessment Board, Flight Readiness Reviews, Design Certification Review and selection of the most important program concerns.

II. SCOPE

The system provided herein enables WDC organizations to enter into the data bank program concerns which are:

- A. The basic responsibility of WDC (clearly not within the scope of any other TIE Center).
- B. An interface requirement (two or more TIE Centers affected).
- C. Coordinated with and rejected by another TIE Center. (The cognizant WDC organization manager or his designee will analyze the Center's reason for rejection, and valid program concerns will be accepted as a WDC responsibility).

III. DEFINITIONS

A. Organization Manager

Organization managers report to the Washington, D. C. Manager.

B. Program Concern

A program concern is a technical or management problem that could: constrain a launch, affect mission safety, identify significant open work items, prevent mission success or affect the accomplishment of mission objectives. Data must be available to justify consideration of a program concern.

C. Data Bank

A computer storage system which contains alpha-numeric data and the control logic to retrieve desired data, one of which is program concerns.

IV. PROCEDURE

- A. Program concerns will be reviewed by the cognizant organization manager or his designee for technical validity. If the program concern is invalid, the cognizant organization manager will return it to the submitting organization with the reason for rejection.
- B. The cognizant organization manager or his designee will determine if valid program concerns are a WDC responsibility. Program concerns which are a WDC responsibility will be sent to the submitting organization for coding on the program concern input form, (WDC 1173). Coding instructions are shown in reference B. The input forms will then be sent to the focal point coordinator for administrative review, and forwarded to WDC Teleservices-Telecomputing Applications for input to the data bank.
- C. Those program concerns which are not a WDC responsibility will be coordinated by the cognizant WDC organization manager or his designee with the appropriate TIE Center. If the TIE Center accepts responsibility, that Center will input the program concern to the data bank.
- D. If the Center does not accept responsibility, the cognizant organization manager or his designee will analyze the Center's reasons for rejection. Invalid program concerns will be sent to the submitting organization, with the reason for rejection. Valid program concerns accepted as a WDC responsibility will be coded on the program concern input form by the submitting organization and sent to the focal point. The focal point will forward them to WDC Teleservices-Telecomputing Applications for input to the data bank.
- E. Requests for data retrieval will be submitted on the program concern retrieval form, (WDC 1176), by organization managers or their designees to the focal point for review. Coding instructions are shown in reference

who will obtain the required data from the Huntsville data bank. The desired data will be sent to the focal point, who will make appropriate distribution.

- F. This "PROCEDURE" section reflects the major actions on the attached flow chart (Figure 1). The attachment describes in detail all actions, decision points and data in sequential flow to be considered in accomplishing the intent of this procedure.

V. RESPONSIBILITIES

- A. The Program Integration Manager will appoint a program concern focal point coordinator.
- B. Program concern focal point coordinator shall:
1. Receive all program concern data input requests and:
 - (a) Check administrative correctness of program concern input form.
 - (b) Check existing program concern listings for possible duplication or relationship.
 - (c) Maintain a log of all submitted program concerns.
 2. Submit input forms to Teleservices-Telecomputing Applications for inclusion in the data bank.
 3. Receive all requests for data retrieval. Assess the request, approve and process it through WDC Teleservices-Telecomputing Applications, or reject the request stating the reason.
 4. Distribute data printouts as appropriate.
- C. WDC Teleservices will:
1. Process all program concern input sheets received from the focal point coordinator.
 2. Provide printouts as required by program concern retrieval forms received from the focal point coordinator.
- D. All WDC Organizations will:
1. Identify and review program concerns associated with their individual areas of responsibility, and accomplish coordination locally and with other TIE Centers as required.

2. Submit program concerns, on the program concern input form, to the focal point coordinator.
3. Submit requests for data retrieval, on the program concern retrieval form, to the focal point coordinator.

PROGRAM CONCERN DATA BANK SYSTEM FLOW

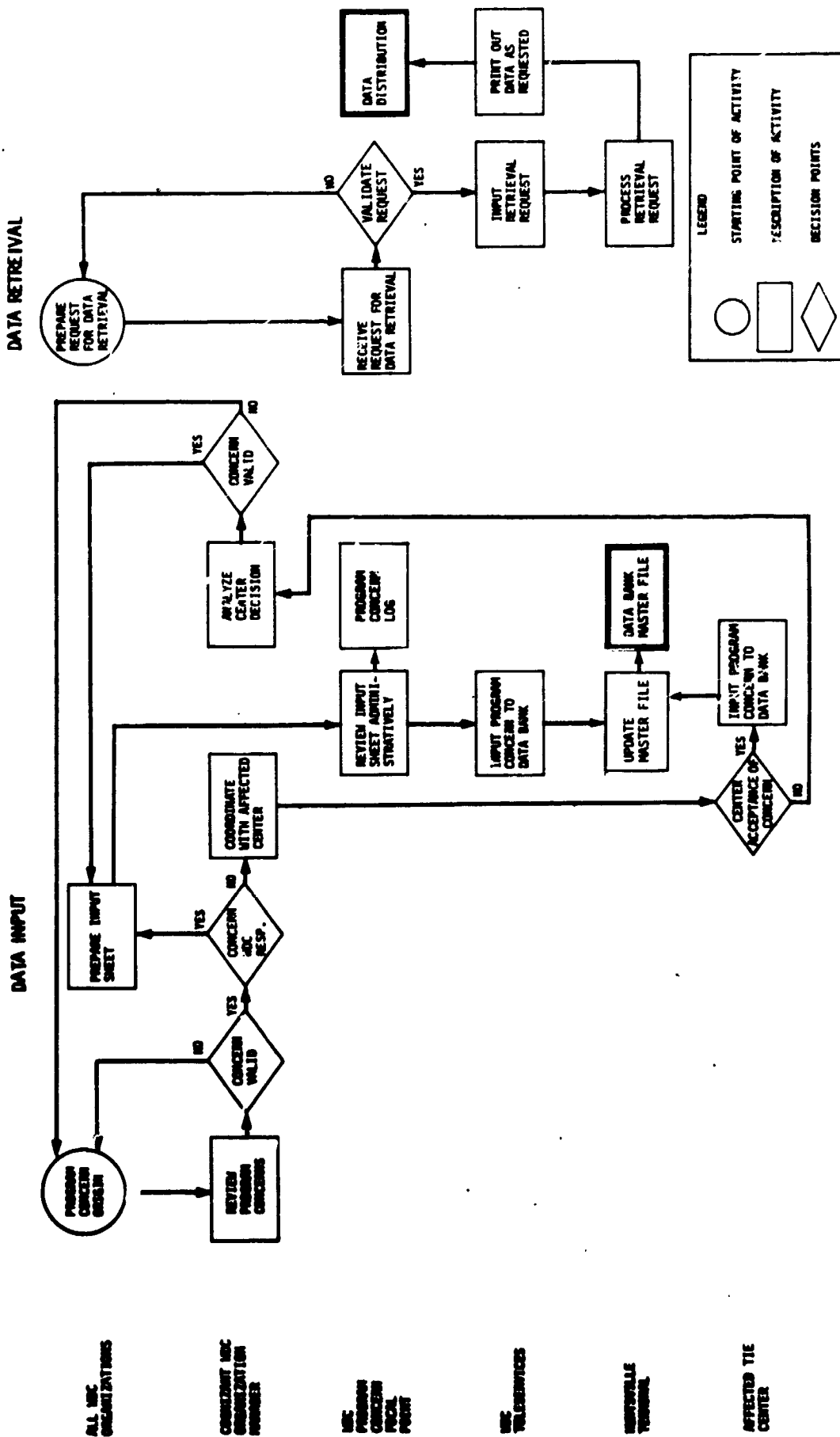


Figure 1

AEROSPACE
SYSTEMS DIVISION

MANAGEMENT DIRECTIVE

WDC 500.8

SUBJECT: APOLLO TIE WORK ADMINISTRATION -
WASHINGTON, D. C.

February 24, 1969
Supersedes issue
dated May 28, 1968

FROM:


C. F. MARTIN
WASHINGTON, D.C. MANAGER

I. INTRODUCTION

This directive assigns actions to be taken by Washington, D. C. TIE organizations in the development and documentation of Apollo TIE work administration media to accomplish Washington, D. C. TIE effort.

II. DIRECTIVE

- A. Program Integration will function as the focal point for work administration and provide an overall operating procedure to define specific responsibilities for work administration development and status.
- B. Contracts will prepare work authorizations and review TIE effort for contract scope.
- C. Teleservices will provide for implementation of document control, correspondence control, and revise existing media as necessary for compliance with this directive.
- D. Finance will provide for implementation of financial cost accounting systems.
- E. All organizations involved in direct TIE work effort which results in a deliverable item, or other significant effort requiring the Washington, D. C. Manager's review, will accomplish their actions in accordance with this directive.

NOTE: Procedures developed in response to this directive (Sections II.B, C, D, and E) shall be in accordance with the Work Administration Procedure described in Section II.A.

AEROSPACE
SYSTEMS DIVISION

OPERATING PROCEDURE

WDC 500.10

SUBJECT: WORK ADMINISTRATION PROCEDURE
APOLLO TIE - WASHINGTON, D. C.

April 7, 1969
Supersedes issue dated
May 28, 1968

AFFECTED ORGANIZATIONS

All Organizations

REFERENCE: (a) Management Directive WDC 500.8,
"Apollo TIE Work Authorization -
Washington, D. C."

FROM: *C. P. Martin*
C. P. MARTIN
WASHINGTON, D.C.
MANAGER

(b) Administrative Procedure 120,
"Correspondence Control -
Washington, D. C."

(c) Administrative Procedure 101,
Supplement No. 1, "Document
Control Program - Washington,
D. C."

(d) Office Instruction WDC 206,
"Preparation of Document
Information Record"

(e) Operating Procedure WDC 500.13,
"Task Activity Records, Apollo
TIE - Washington, D. C."

I. PURPOSE AND SCOPE

This procedure describes the system prescribed by the reference (a) directive to provide work authorization, status and transmittal of WDC TIE deliverable items to NASA/APO.

II. GENERAL

- A. It is essential that the initiation, preparation and transmittal of deliverable items be controlled, monitored and documented.
- B. Deliverable items are defined as documents, reports, memorandums and presentations delivered to NASA/APO in response to one of the following:
 - 1. Specific CDRL items required by the contract or contract changes;

2. Non-CDRL items:
 - a. NASA Technical Directives (TDs);
 - b. NASA memorandums;
 - c. Oral requests from NASA;

NOTE: No external requests for effort will be accepted at a level lower than a Washington Task Manager. Items b and c will be responded to only when originated by an APO Task Director or higher authority.

- d. Internally generated requests.
- C. Finance reports to NASA as required on Form 533 are excluded from this procedure.
- D. Emphasis direction is reviewed periodically by NASA. Resultant changes are sent to Boeing under the signature of the Apollo Program Director or his designee. Upon receipt, a review will be made by WDC-TIE management and direction given to responsible organizations.
- E. A flow diagram of this procedure is attached, (Figure 1). It shows in chronological order the events necessary for implementing the work administration system and illustrates organizational responsibilities.

III. RESPONSIBILITIES

A. Teleservices will:

1. Process correspondence and formal documentation in accordance with references (b) and (c), respectively;
2. Assure that all required Government Furnished Documentation is ordered from the appropriate source after it is identified by the using organizations;
3. Compile delivery package, including DIR if required, and distribute in accordance with both Apollo Data Bank and internal requirements.

B. Contracts will:

1. Prepare or update work authorizations;
2. Maintain Delivery Information Log for CDRL items;
3. Review work effort for contract scope condition and serve as the point of contact with NASA Contracts for the settlement of out-of-scope direction;

4. Verify contractual performance.

C. Program Integration will:

1. Serve as point of contact with the NASA/TIE Technical Director;
2. Coordinate and confirm all directions for deliverable item preparation, including work authorization, internally generated requirements, and written and oral direction from NASA. Coordinate to clarify actions as required between responsible organizations and APO Task Directors with the TIE Technical Director except for out-of-scope concerns;
3. Establish and maintain Task Activity Record (TAR) system and update schedules, as required by reference (e);
4. Prepare status reports and provide data for management reviews;
5. Approve Document Information Record (DIR) for CDRL items described in II.B.1.

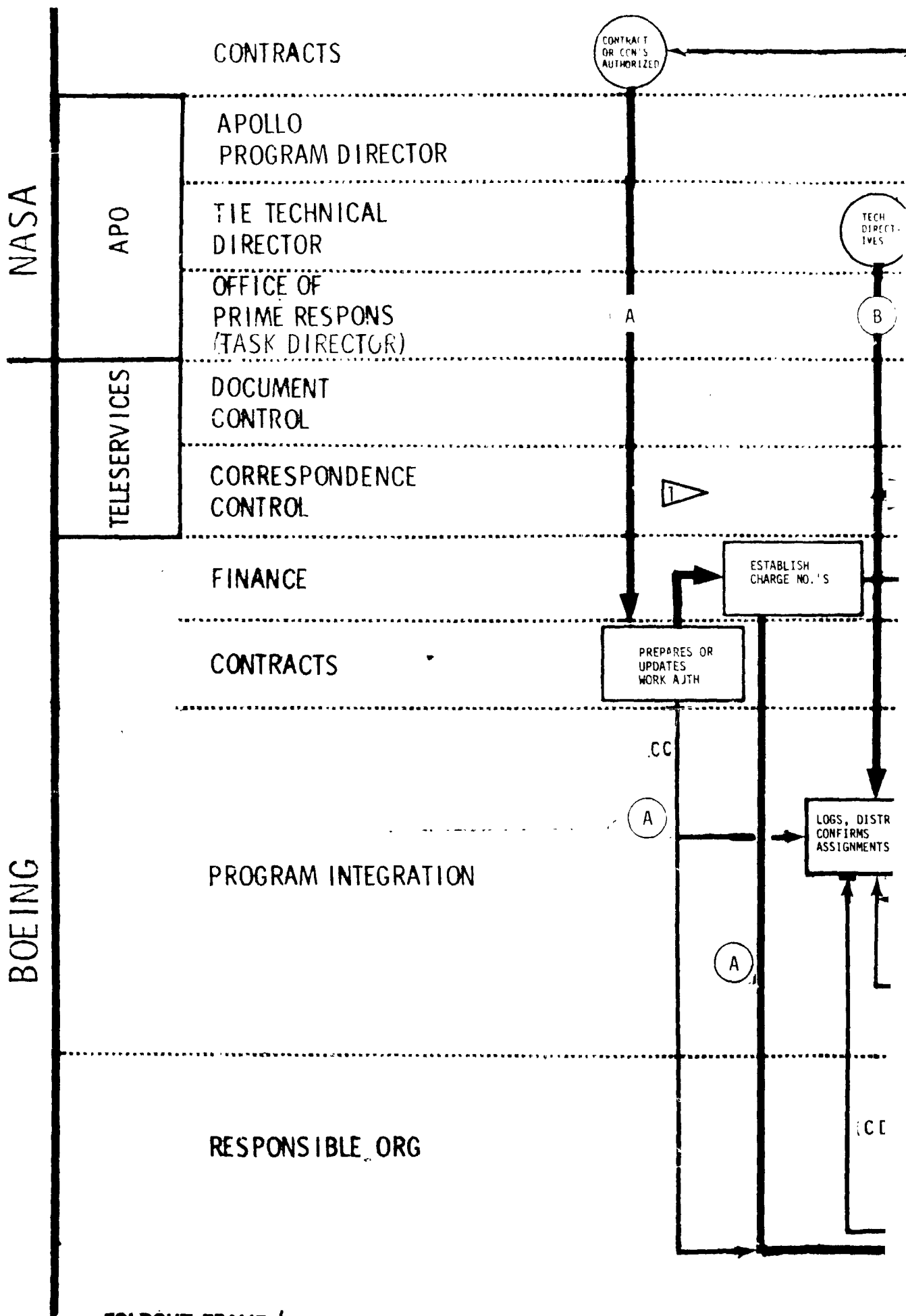
D. Finance will:

1. Assign charge numbers;
2. Provide timely cost information as required.

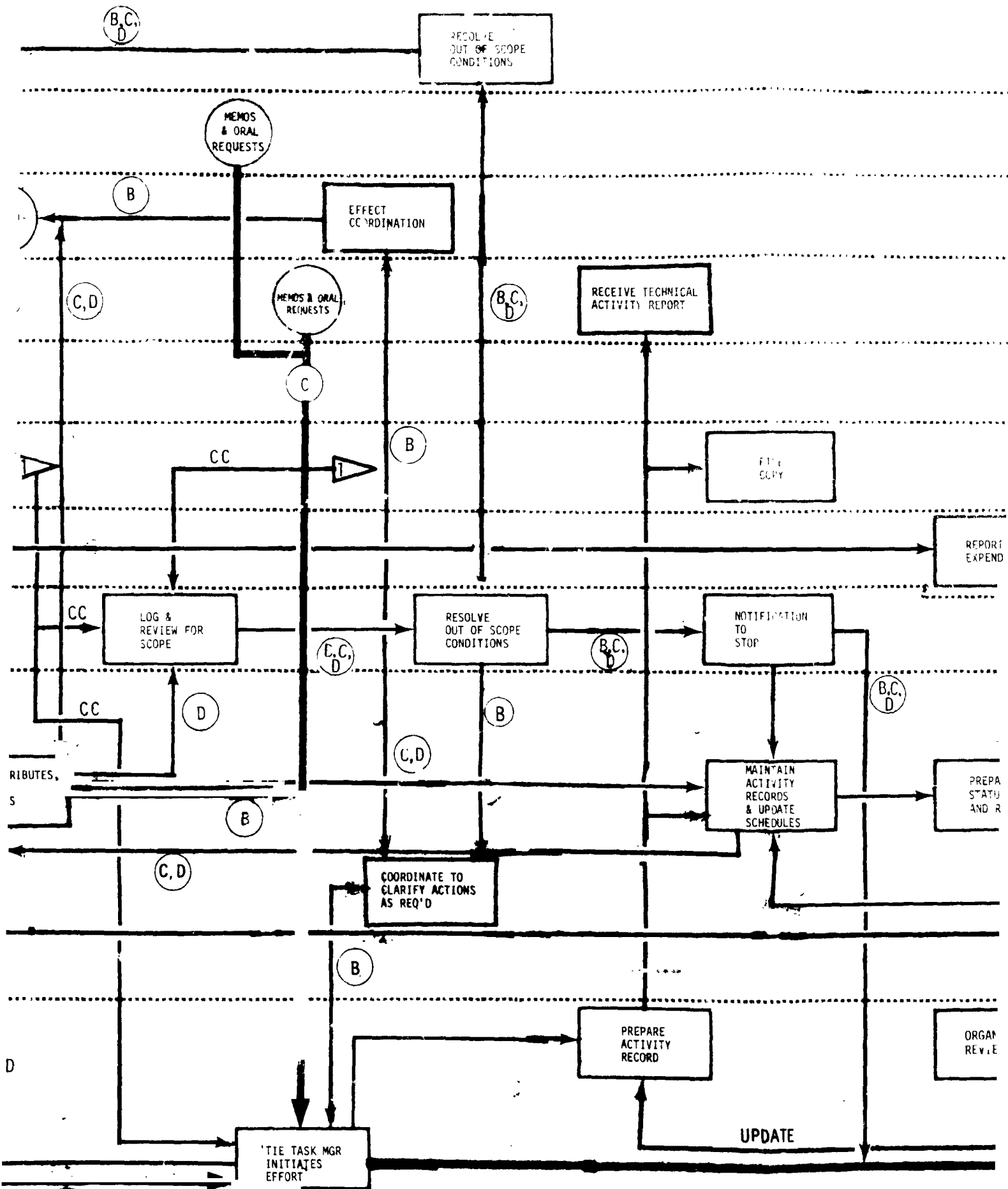
E. Organizations having prime responsibility for preparing the deliverable item will, in accordance with the references:

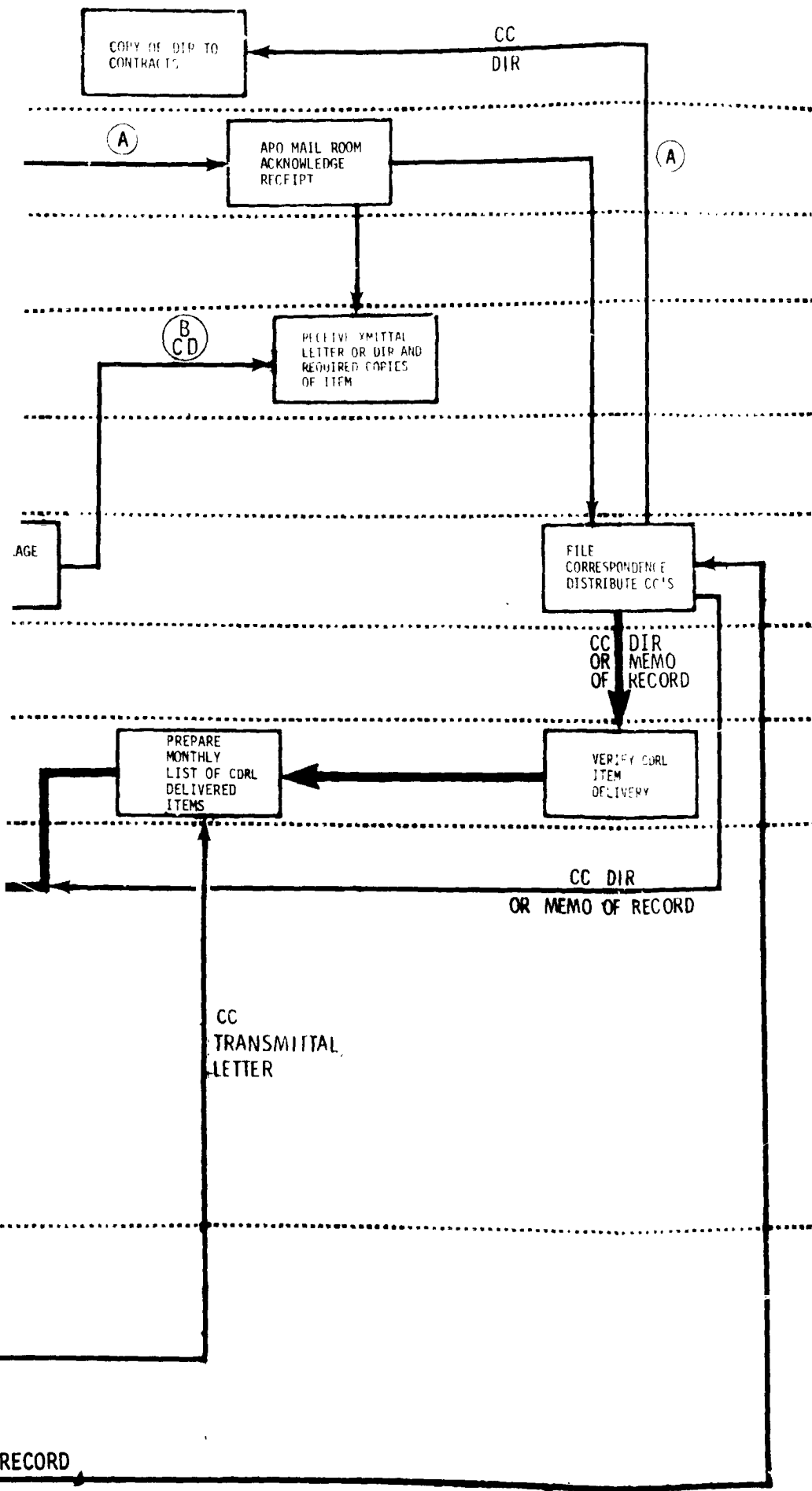
1. Establish internal controls and procedures for the accomplishment of assigned tasks;
2. Prepare and deliver to Program Integration a plan, schedule, and record of activity (TAR), in accordance with reference (e);
3. Provide status to Program Integration as required for report information and update of the activity record (TAR);
4. Prepare Document Information Record, per reference (d), for approval by Program Integration on items reflected in II.B.1;
5. Prepare transmittal letter (cc: to Program Integration and Boeing Contracts) to the appropriate APO Task Director for non-CDRL items;

6. When urgency requires that the originating organization make hand carried delivery of a CDRL item, the delivery will be made in accordance with Section IV of reference (d).
7. For non-CDRL items hand carried directly to the customer, a copy of the item and transmittal letter will be provided to Correspondence Control.



FOLDOUT FRAME 1

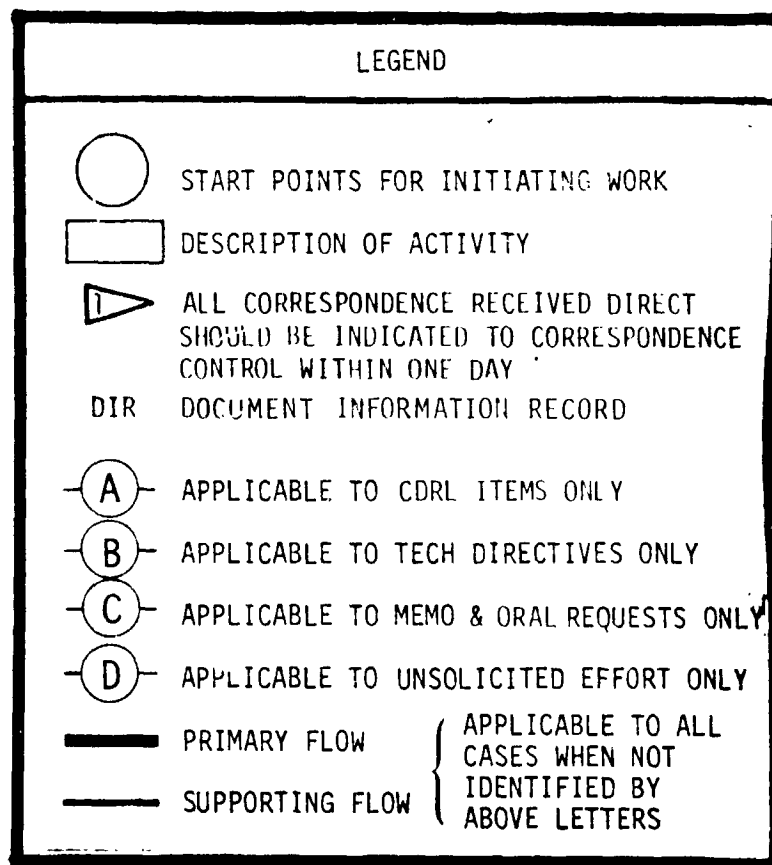
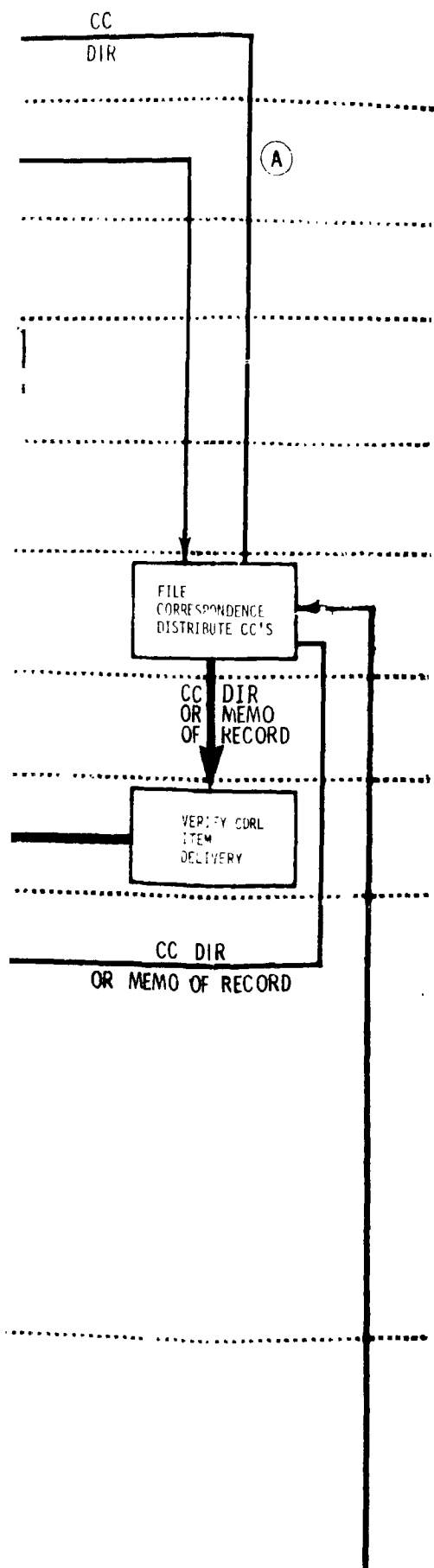




LEGEND

- START POINTS FOR
- DESCRIPTION OF ACT
- ALL CORRESPONDENCE SHOULD BE INDICATED WITHIN ON DOCUMENT INFORMATION
- APPLICABLE TO CDR
- APPLICABLE TO TEC
- APPLICABLE TO ME
- APPLICABLE TO UN
- PRIMARY FLOW
- SUPPORTING FLOW

WORK ADMINIS



WORK ADMINISTRATION FLOW

AEROSPACE
SYSTEMS DIVISION

OPERATING PROCEDURE

WDC 500.13

February 24, 1969

SUBJECT: TASK ACTIVITY RECORDS, APOLLO TIE -
WASHINGTON, D. C.

REFERENCES: (A) MANAGEMENT DIRECTIVE 500.8,
"APOLLO TIE WORK AUTHORIZA-
TION - WASHINGTON, D. C."

FROM:

(B) OPERATING PROCEDURE WDC
500.10, "WORK ADMINISTRATION
PROCEDURE APOLLO TIE -
WASHINGTON, D. C."

C. F. Martin
C. F. MARTIN
WASHINGTON, D. C.
MANAGER

I. PURPOSE AND SCOPE

This procedure describes the system prescribed by the reference (A) directive and amplified by the reference (B) procedure to provide work administration visibility and control for WDC-TIE effort. The procedure provides criteria for the determination of the requirement for a Task Activity Record (TAR) sheet to cover specific WDC effort and instructions for initiating, maintaining and retaining the TAR sheet.

II. TAR REQUIREMENT CRITERIA

A WDC-TIE activity is defined as authorized work effort performed by WDC-TIE personnel in response to NASW-1650. The TAR is the basic form used to identify, schedule, authorize, monitor, and report these activities. The following WDC activities will be entered on a TAR.

- A. Activities resulting in deliverable items identified in the Contract Data Requirements Lists (CDRL).
- B. Activities requested by APO Task Directors or higher authority by Technical Directives, memorandums, letters, and verbal requests.

NOTE: Occasional activity in response to APO requests requiring less than 80-hours effort are exempted. If this type activity is recurring, it should be covered by a general TAR for short term activities.

- C. Activities generated by WDC-TIE organizations which are expected to result in a deliverable item to APO.
- D. Significant support activities to other WDC-TIE organizations or TIE locations.

In general, task and organizational managers should prepare TARs for any TIE activity that they wish to review with APO Task Directors or the Washington, D. C. Manager.

III. TAR RECORD PREPARATION INSTRUCTIONS

A. TARs are initiated and maintained by organizations assigned or assuming responsibility for the satisfactory conduct of a specific WDC-TIE work activity.

B. Description of Entries

The TAR sheet will reflect the following information (see exhibit).

1. Title: Enter the title of the activity.
2. Authorized By: Approval signature of the appropriate TIE organization manager or the Washington, D.C. Manager.
3. Description: Enter a description of the activity to be accomplished. Activities are to be described in terms of objectives, expected results, measurable outputs, and/or finite events.
4. Scheduled Event or Delivery: These blocks provide for a sequential listing of major scheduled events or delivery dates pertaining to the activity, such as GFD required dates, due dates for reports, meetings, assessments, and other key events. The Schedule (Sched) space should reflect the official, recognized, schedule date in numerical form (i.e. 6-31-69). The (ECD) Estimated Completion Date space should reflect the most recent estimate for the event. If the activity is on schedule, the same date will appear in both spaces. Any change in the schedule or ECD date will require explanatory remarks in the status block.
5. Status Remarks: Enter in this space a statement of the status of the activity, as of the "cutoff" date for the current revision. The statement should provide a brief narrative pertaining to current effort and should be self-explanatory. Milestones which are: (a) currently behind schedule, (b) will potentially not meet the schedule date or have been revised, should be specifically explained in terms of cause, program impact, and corrective action. Particular emphasis should be placed on those items which are CDRL or Technical Directive responses. DIR or transmittal letters will be noted for current deliveries.

6. SOW Paragraph: Reference the appropriate contract Statement (s) of Work section by subparagraph.
7. Date Initiated: Date work on the activity began.
8. WDC Responsible Manager: Enter the name of the manager having responsibility for the activity.
9. Support: Enter the name(s) and location of manager(s) supporting the activity.
10. Authority: Enter the reference number of the T/D, memo, and/or other authorization which originated and revised the activity.
11. APO Interface: Enter name of the APO counterpart with whom interface is maintained.
12. Category: Each TAR will be cataloged under one of three descriptions; assessment, technical data base, or management data base. The definitions by category are:

Assessment - An activity involving an assessment or analysis of management or technical data, studies or proposals.

Technical Data Base - An activity establishing a technical baseline of information in response to TIE Engineering, or other technical requirements.

Management Data Base - An activity establishing management information.
13. Status As Of: Enter the cut-off date for information contained on the TAR (this date will change bi-weekly).
14. Activity Record Number: Enter the number assigned by Internal Planning for identifying purposes.

IV. TAR UPDATING, ASSESSMENT, REVIEW, AND RETIREMENT

- A. TAR sheets will be updated every two weeks for status through the end of business on Thursday.
- B. The TAR sheets will be published in a formal document, D2-117067-1, "Activity Record Document WDC-TIE", after each update.
- C. TAR sheets will be reviewed at regular management reviews.

- D. Action items and due dates will be assigned as a result of these reviews.
- E. TAR sheets that have been completed, cancelled, deleted, combined, or otherwise inactivated will be so identified, with explanation for action, printed once in the D2-117067-1 document then placed in D2-117067-2, "Activity Record Document WDC-TIE Historical Record". This document will be distributed quarterly.

V. RESPONSIBILITIES

In addition to the organizational responsibilities assigned in the referenced command media:

A. Program Integration will:

- 1. Receive and review updated TAR sheets from affected organizations.
- 2. Coordinate updated TARs where necessary and finalize them for incorporation into the overall document update.
- 3. Prepare and update:
 - (a) All schedules displayed in the document.
 - (b) Apollo TIE WDC Delivery tabulation.
 - (c) "Active TAR Category Matrix".
 - (d) Work Administration Activity Records for each task.
 - (e) A WDC-TIE Administration Summary for incorporation into the document for each update.
 - (f) Cross index appendices for TAR reference to TD and CDRL items.
- 4. Prepare and distribute D2-117067-1 document on a regular two week cycle.
- 5. Prepare agenda and chair management reviews of the TAR sheets.
- 6. Record and follow-up on action assignments resulting from management reviews.
- 7. Administer the D2-117067-2 document as described in paragraph IV.E. of this instruction.

- B. Organizations having prime responsibility for the conduct and completion of the WDC-TIE activities will:
1. Prepare and update TAR sheets for all WDC-TIE activities in accordance with this procedure.
 - Completed masters will be delivered to Internal Planning two days prior to the scheduled cut-off date.
 2. Participate in management reviews of TARs and react to the action items assigned.

<input type="checkbox"/> <input checked="" type="checkbox"/>	TITLE:		(2)
<input checked="" type="checkbox"/> WDC		(1)	AUTHORIZED BY:

DESCRIPTION:

SCHED EVENT OR DELIVERY	SCHED.	ECD.	SCHED EVENT OR DELIVERY	SCHED.	ECD.
④			④		

STATUS REMARKS:

WDC RESPONSIBLE MGR.	(8)
SUPPORT	(9)
SCM PARA.	(6) INITIATED (7)
APO INTERFACE	(11)
CATEGORY	(12)
AUTH.	(10)

STATUS AS OF: 13

TASK ACTIVITY RECORD NO. 14

EXHIBIT TO O. P. WDC 500.13

AEROSPACE
SYSTEMS DIVISION

OPERATING PROCEDURE

WDC 710.3

SUBJECT: PROCESSING OF NASA TECHNICAL
DIRECTIVES

April 7, 1969

REFERENCE: (a) Operating Procedure
WDC 500.10, "Work
Administration Procedure
Apollo TIE-Washington, D.C."

FROM: *C. E. Martin*
C. E. MARTIN
WASHINGTON, D.C.
MANAGER

I. PURPOSE AND SCOPE

This procedure establishes the requirement and system for the preparation and coordination of the "Technical Direction Acknowledgement" (TDA) form to be sent in response to Technical Directives (TD) received from NASA-APO under the terms and conditions of Contract NASW-1650.

II. GENERAL

The purpose of the TDA form is threefold: (a) Acknowledge receipt of a TD to the APO-TIE Technical Director. (b) Assign action responsibility to a Boeing Task Manager. (c) Apprise the issuing TIE Task Director of the immediate course of action to be taken by the WDC-TIE work force.

III. RESPONSIBILITY

A. Program Integration will:

1. Receive, assess, and notify Contracts and the responsible organization within 24 hours of the receipt of the TD.
2. Monitor preparation of the TDA form.
3. Approve and assure delivery of the completed TDA form to the APO-TIE Technical Director and the TIE Task Director.

B. The Responsible Organization will:

1. Evaluate the TD and determine the appropriate course of action.
2. Complete the TDA form within 48 hours after notification from Program Integration.
3. Coordinate the completed form with Contracts and Program Integration.
4. Maintain informal coordination with the appropriate (issuing) TIE Task Director.

5. Initiate or update Task Activity Record (TAR) in consonance with proposed action and in accordance with reference (a).
6. Implement and complete assigned action.

C. Contracts will:

1. Review the TD and TDA form for Contract appropriateness.
2. Notify Program Integration whether the response to the TD is contractually acceptable or not within 24 hours from receipt of the response.

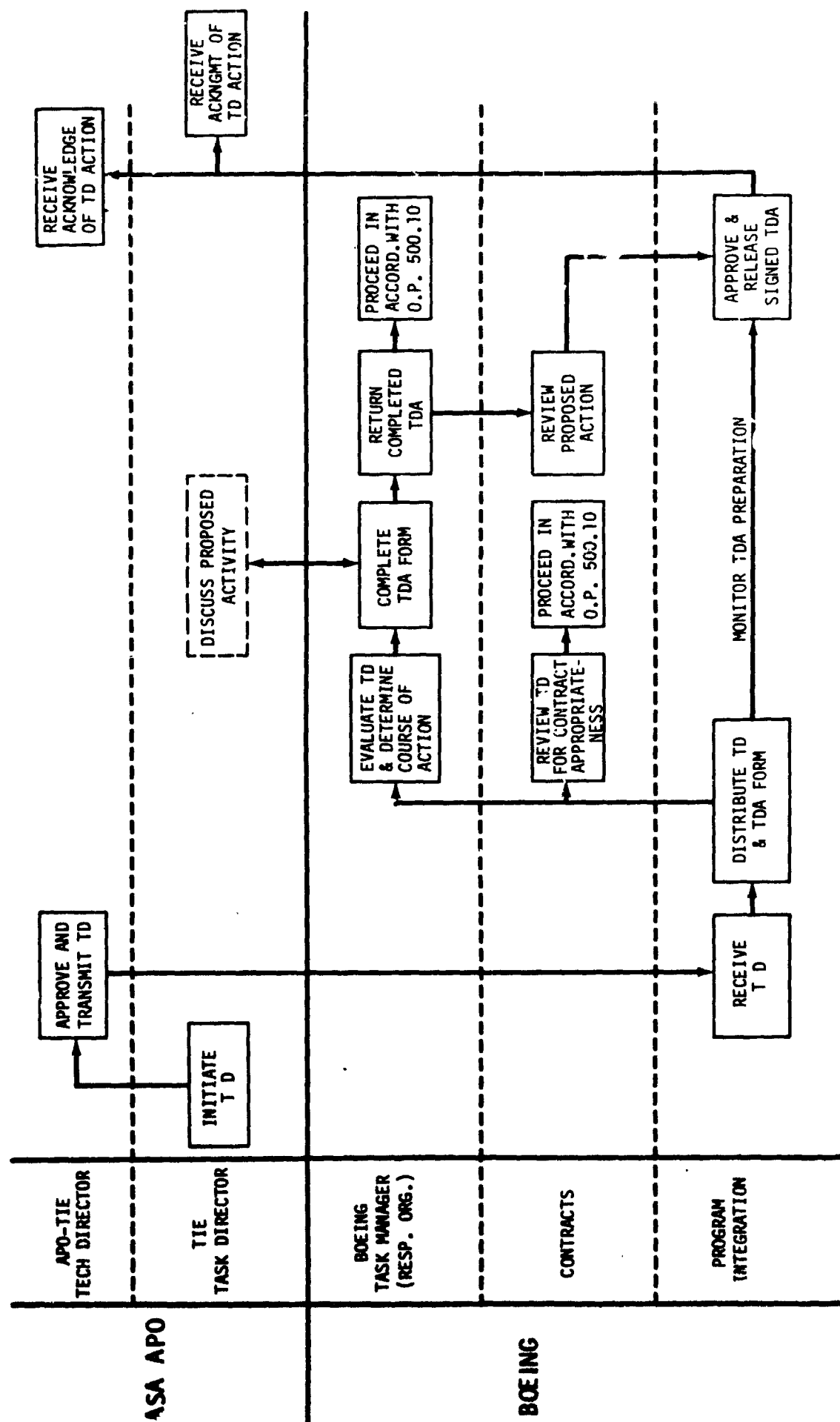
Attachment A charts the flow of the TDA from initiation to delivery and indicates the responsibilities of the organizations and offices as described above.

IV. TDA PREPARATION INSTRUCTIONS

Attachment B is a sample form of the Technical Directive Acknowledgement form. The following statements are guidelines for preparing the form:

1. Enter the date.
2. Enter TIE Task Director's name.
3. Enter Serial number of the TD.
4. Enter name of the Boeing Task Manager or his designee assigned the action responsibility.
5. Check the appropriate box. (1 only)
6. Enter explanatory statement required.
7. Boeing Task Manager's signature.
8. Program Integration Manager's signature.
9. Contracts Manager's initials of agreement.

TECHNICAL DIRECTION ACKNOWLEDGEMENT FLOW



Attachment B

THE **BOEING** COMPANY AEROSPACE GROUP • AEROSPACE SYSTEMS DIVISION
APOLLO TECHNICAL INTEGRATION AND EVALUATION P.O. BOX 1079, WASHINGTON, D.C. 20013

DATE ①

TECHNICAL DIRECTION ACKNOWLEDGEMENT

TO: LT COL. W.E. BEEBE, APO-TIE TECHNICAL DIRECTOR
② _____ TIE TASK DIRECTOR

CC: D. E. MARCHUS, CONTRACTS MANAGER

SUBJECT: TECHNICAL DIRECTIVE NASW-1650, SERIAL # ③

THE SUBJECT TECHNICAL DIRECTIVE HAS BEEN ASSIGNED TO
④ _____
(NAME)

☐ DIRECTED ACTIVITY WILL BE IMPLEMENTED IMMEDIATELY

☐ DIRECTED ACTIVITY WILL BE IMPLEMENTED WITH THE
FOLLOWING EXCEPTIONS: _____

☐ DIRECTED ACTIVITY CANNOT BE IMPLEMENTED BECAUSE: _____

⑦ _____
BOEING TASK MANAGER

⑨ APPROVED: ⑧ _____
BOEING PROGRAM
INTEGRATION MANAGER

AEROSPACE
SYSTEMS DIVISION

MANAGEMENT DIRECTIVE

WDC 515.1

SUBJECT: CORRESPONDENCE APPROVAL ROUTING, April 7, 1969
SIGNATURE AUTHORITY, AND APO INTERFACES, Supersedes issue
WASHINGTON, D. C. dated
December 17, 1968

TO: ALL WASHINGTON, D. C. ORGANIZATIONS

REFERENCES: (A) D2-114157-7, "Authorized Signatures-
Washington, D. C. Operating Arm"

(B) O.P. 500.10, "Work Administration
Procedure - Apollo TIE -
Washington, D. C."

FROM: *C.P. Martin*
C.P. MARTIN
WASHINGTON, D.C.
MANAGER

I. PURPOSE

This directive establishes a uniform approval routing and signature authority policy for the Washington, D. C. Operating Arm. Good business practice requires that correspondence addressed to NASA, and company personnel at other locations be routed for approval by impacted Washington organizations, and be signed by the appropriate level of management.

II. DEFINITIONS

- A. Correspondence is defined as letters, memorandum, pre-printed forms (i.e., DIR), documents and reports.
- B. Organization managers report to the Washington, D. C. Manager.
- C. Second-level managers report to organization managers.

III. LIMITATIONS

Correspondence covered by Section 4.0 of reference A is specifically excluded from control of this directive. Section IV below offers guidelines for correspondence falling within the intent of this directive.

IV. POLICY

A. Approval Routing

All outgoing correspondence, whether internal or external to the company, will be routed to and approved by all affected organizations. All correspondence which affects two or more of the seven principal organizations will be routed to and approved by the respective organization managers or their designees. All organizations will adhere to the intent of this "policy" section, in establishing approval routings for correspondence.

Correspondence prepared for the signature of a higher level of management will be routed up the line organization, in addition to any inter-organizational routing required. Further, all correspondence prepared for the Apollo TIE Manager will be routed to the Washington, D.C. Manager for approval.

B. Authorized Signature Authority

1. Internal Company Correspondence

- a. Internal correspondence addressed to Aerospace Group organization heads or Operating Arm Managers will be signed by the Apollo TIE Manager or the Washington, D. C. Manager.
- b. Correspondence addressed to other Apollo TIE or Aerospace Systems Division locations will generally be on a counterpart-to-counterpart basis.
- c. Correspondence internal to the Washington D.C. Operating Arm may be signed by any originator, however, it is always good practice for the organizational level of the signer to be comparable to that of the addressee.
- d. Routine administrative correspondence between functional organizations will be signed by the cognizant WDC functional manager.

2. Correspondence to the Customer

- a. Signature authority for certain items of recurring correspondence are specifically mentioned in attachment A. All other contractual correspondence to the customer related to contract performance, additional commitments, amendments, proposals, or company policy will be prepared for the signature of the Contracts Manager and routed through the Washington, D.C. Manager for approval prior to signature. Correspondence pertaining to TIE resources forecasts (manpower, overtime, facilities requirements, etc.) will be coordinated with the cognizant organization manager prior to signature.
- b. Non-contractual correspondence to the customer, originating either internally or in response to customer correspondence, which requires judgment or decision relative to a commitment, or a program management course of action, or a technical work commitment within the contract scope will be signed by the Washington, D.C. Manager or an organization manager, dependent upon the addressee, in consonance with the non-task oriented interface matrix of attachment B, or the task oriented

interface matrix contained in Appendix B of the monthly Technical Progress Report. The Washington, D. C. Manager will receive a copy of all such correspondence signed by organization managers.

- c. Correspondence related to transmittal of a contract deliverable item or in response to a customer request will be handled as described by reference B.
- d. Routine reports or correspondence to the customer regarding continuing technical work in process will be signed by (or "signed for") cognizant second-level managers, unless specific delegations are authorized. The level of signature delegation and required approval routing will be designated by each organization manager.

C. Delegation of Signature Authority

In the interest of program efficiency, the authority to sign or to "sign for" may be delegated downward when deemed necessary. It is desirable that such delegations be held to one level below the delegator. Delegations beyond one level below the delegator will be defined in writing by each organization manager and submitted to the Washington, D. C. Manager.

D. Apollo Program Office Interfaces

Certain Washington, D. C. NASA interfaces are not contract task oriented and therefore are not the responsibility of designated Task Managers. These NASA/Boeing interfaces are defined in Attachment B. Normally company contacts with the NASA personnel indicated will be limited to the Boeing personnel defined in Attachment B.

IV. RESPONSIBILITIES

- A. Teleservices - Correspondence Control will monitor all outgoing correspondence for compliance with this directive. Serious discrepancies will be called to the attention of the appropriate organization manager.
- B. All organizations will establish internal controls to ensure compliance with the intent of this directive.

S= Signature Authority
A= Approval Routing

AMRAB Assessment Letter

GMIS Report

Technical Progress Report

Task Activity Record Document

DIR for CDRL Items - 1st Signature

DIR for CDRL Items - 2nd Signature

Memos/Reports to APO Task Directors

Finance 533 Report

Morning Report

FINANCE MGR.

P. I. MANAGER

ENGINEERING MGR.

WASHINGTON MGR.

APOLLO TIE MGR.

A A

S

S A

S

Cognizant Organization Manager

S

Cognizant Task Manager

S

S

Attachment

NASA/BOEING NON-TASK ORIENTED INTERFACE MATRIX

Attachment B

NASA

BOEING

APOLLO PROGRAM DIRECTOR/DEPUTY DIRECTOR

ASSISTANT DIRECTOR (MANAGEMENT)

ASSISTANT DIRECTOR (TECHNICAL)

DIRECTOR - TEST

DIRECTOR - OPERATIONS

MISSION DIRECTOR

DIRECTOR - PROGRAM CONTROL

TIE TECHNICAL DIRECTOR/TECHNICAL MANAGER

CONTRACTING OFFICER

MSF DATA MANAGER

APOLLO TIE MANAGER/WASHINGTON, D. C. MANAGER

WASHINGTON, D. C. MANAGER

ENGINEERING MANAGER

ENGINEERING MANAGER

ENGINEERING MANAGER

WASHINGTON, D. C. MANAGER

PROGRAM INTEGRATION MANAGER

PROGRAM INTEGRATION MANAGER

CONTRACTS MANAGER

TELESERVICES MANAGER

AEROSPACE
SYSTEMS DIVISION

OFFICE INSTRUCTION

WDC 206

SUBJECT: PREPARATION OF DOCUMENT
INFORMATION RECORD

April 7, 1969
Supersedes Issue
Dated July 23, 1968

REFERENCE: (A) Operating Procedure WDC 500.10,
"WORK ADMINISTRATION PROCEDURE,
APOLLO TIE-WASHINGTON, D. C."

FROM:

C. F. Martin
C. F. MARTIN
WASHINGTON, D.C. MANAGER

FORM PROCESSED BY THIS INSTRUCTION:

"DOCUMENT INFORMATION RECORD" - WDC 1214

I. GENERAL

Organizations submitting written material to NASA in fulfillment of Contract Data Requirements List (CDRL) obligations under Contract NASW-1650 will transmit the material through Boeing Correspondence Control using Form WDC 1214, "Document Information Record," (DIR). The purpose of the DIR is to provide a simple mechanism to effect transmittal of a CDRL item and for notifying all affected parties that a CDRL delivery has been made, per reference A.

II. PREPARATION

- A. The DIR form is in addition to and is not intended to replace a cover letter if such is appropriate to explain a document or report, etc. The DIR is always used to transmit a CDRL item.
- B. The DIR will be prepared by the Boeing organization which prepared the CDRL item.
- C. The DIR form (attachment A) is to be completed as follows:
 1. "APO Task Director" - Name of APO Task Director, or prime NASA recipient, and office code.
 2. "Type of Submittal" - Enter the general type of material which is being transmitted by the DIR. Examples are: Letter, Report, Document, etc.
 3. "Submittal Frequency" - Indicate the CDRL required or intended frequency of submittal of the material.
 4. "If Repetitive" - For a recurring type of delivery such as a weekly report or a per event type assessment, indicate the month and year of the first such

- submittal, followed by the number (quantity) of submittals made prior to the current release.
5. "Security Classification" - Indicate the level of classification of this submittal (e.g., SECRET, CONFIDENTIAL, etc.) or the word "UNCLASSIFIED."
 6. "Other Restrictions If Applicable" - This will normally be left blank unless particular distribution or limitation of distribution is desired. If so, appropriate notation should be entered. An example of limited distribution might be: "LIMIT DISTRIBUTION TO APOLLO PROGRAM DIRECTORS OFFICE ONLY."
 7. "Boeing Approval" -
 - a. The first signature block on the DIR form shall be signed only by Managers reporting to the Washington, D. C. Manager or their designees, within the scope of their organization's responsibility.
 - b. The second signature block shall be signed by the Program Integration Manager or his designee.
 8. "Contract SOW (Statement of Work) Task No." - Enter the appropriate SOW Task No. and title. If the delivery is in response to a Contract Schedule Article instead of a SOW Task, indicate "Schedule Article" and the number of the article (i4.1 or 2.3.6, for example).
 9. "Transmittal Letter No." - If a transmittal letter accompanies the material being delivered, the Boeing transmittal letter number should be entered on this line. If no transmittal letter is used, assign and enter a letter number, from the regular correspondence log.
 10. "DRL No. A004" - Enter the sequence number of the CDRL item.
 11. "Boeing TAR No.," - The number of the related Boeing TAR (Task Activity Record).
 12. "Material Transmitted" - Enter a complete description of the material being transmitted. The information shown will be utilized to determine whether all contract requirements have been fulfilled, thus a complete and accurate description is required. Indicate the number of copies to be transmitted to NASA, both as a matter of delivery record and as distribution instruction for Boeing Correspondence Control.

Brief explanatory notations may also be entered in this space, or a transmittal letter may be added for this purpose.

III. DELIVERY PROCEDURE

- A. The Originating Organization shall retain only the last (pink copy) of the DIR. The remaining DIR copies, and one copy of the deliverable data, (a reproducible master if applicable) shall be handcarried to Correspondence Control.
- B. Correspondence Control will:
 - 1. Reproduce copies of the deliverable data for distribution to NASA, as specified by the DIR and Apollo Data Bank.
 - 2. Hand carry one copy of the deliverable data and the DIR form to NASA APO Correspondence Control. Obtain receipt stamp on original white, yellow and green copies of the DIR form from NASA APO Correspondence Control clerk. Attach second white copy of DIR to deliverable data and leave data with clerk for delivery. Return all other copies of DIR for distribution.
 - 3. Distribute the remaining DIR copies as follows:
 - Original White - To NASA Contracting Officer.
 - Yellow - To WDC Contracts.
 - Green - To MSF Data Management.
 - Blue - To WDC Program Integration.
 - Gold - Retain with one copy of the deliverable data. This is the copy of the data which shall be retained for the period required by the contract.

IV. TRANSMITTAL OF DELIVERABLE ITEM

Generally, transmittal of the deliverable data will be handled by Correspondence Control, as specified in II.B.1 and 2 above. In those instances where urgency requires that the transmitting organization make "hand-carried" delivery, the second white copy of the DIR shall accompany the data. The remaining effort is as specified in section III.A. above.

THE BOEING COMPANY
DOCUMENT INFORMATION RECORD (DIR)

TO: NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION WASHINGTON, D.C. 20546

ATTENTION: _____

(1)

APD TASK DIRECTOR AND OFFICE CODE

(2)

TYPE OF SUBMITTAL _____

(LETTER, REPORT, DOCUMENT, ETC.)

(3)

SUBMITTAL FREQUENCY (ONE TIME, WEEKLY, PER LAUNCH, ETC.)

IF REPETITIVE _____

MO/YR INITIAL

AND

NO. OF PREVIOUS
SUBMITTALS

(4)

SECURITY

CLASSIFICATION _____

(5)

OTHER RESTRICTIONS

IF APPLICABLE _____

(6)

BOEING APPROVAL:

1. _____

SIGNATURE

TYPE

DATE

(7)

TYPE NAME _____

AND TITLE _____

2. _____

SIGNATURE

TYPE

DATE

TYPE NAME _____

AND TITLE _____

DO NOT USE SPACE BELOW

CONTRACT NASW-1650

CONTRACT SOW TASK NO. _____

(8)

TRANSMITTAL LETTER NO. _____

(9)

DRL NO. A004 -

(10)

BOEING T.A.R. NO. _____

(11)

**MATERIAL
TRANSMITTED:**

LIST DOC. NO. AND TITLE, REV. NO. AND
DATE, LETTER NO. AND SUBJECT, DESCRIPTION,
TOTAL PAGES, ETC., AS APPLICABLE.
INDICATE NO. OF COPIES TO BE TRANSMITTED
TO NASA. EXPLANATORY COMMENTS MAY
BE INCLUDED IF APPROPRIATE.

(12)

NASA RECEIPT:

ACKNOWLEDGE
RECEIPT ONLY

ROUTING: 1. ORIGINATING ORGANIZATION RETAINS PINK COPY
OF DIR.

2. SEND ALL OTHER DIR COPIES AND DELIVERABLE
DATA TO BOEING CORRESPONDENCE CONTROL
FOR DELIVERY TO NASA.

WDC-1214 REV. 2-69

ATTACHMENT A

ACTIVE SHEET RECORD											
SHEET NUMBER	REV LTR	ADDED SHEETS				SHEET NUMBER	REV LTR	ADDED SHEETS			
		SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR			SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR
i						4-13					
ii						4-14					
iii						4-15					
iv						4-16					
v						4-17					
1-1						5-1					
1-2						5-2	A				
1-3						5-3					
2-1						5-4					
2-2	A							5-5	A		
2-3	A							5-6	A		
2-4								5-7	A		
2-5						6-1					
2-6											
2-7											
		2-8	A								
		2-9	A								
2-10	A	2-11	A								
		2-12	A								
3-1											
3-2											
3-3											
3-4											
3-5											
3-6											
3-7											
3-8											
3-9											
4-1											
4-2											
4-3											
4-4											
4-5											
4-6											
4-7											
4-8											
4-9											
4-10											
4-11											
4-12											

ACTIVE SHEET RECORD											
SHEET NUMBER	REV LTR	ADDED SHEETS				SHEET NUMBER	REV LTR	ADDED SHEETS			
		SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR			SHEET NUMBER	REV LTR	SHEET NUMBER	REV LTR
A-1											
A-2											
A-3											
A-4											
A-5											
A-6											
A-7											
A-8											
A-9											
A-10											
A-11											
A-12											
A-13											
A-14											
A-15											
A-16											
A-17											
A-18											
A-19											
A-20											
A-21											
A-22											
A-23											
A-24											
A-25											
A-26											
A-27											
A-28											
A-29											
A-30											
A-31											
A-32											
A-33											
A-34											
A-35											
A-36											
B-1											
B-2											
B-3											

D2-117067-1

REVISIONS

REV. SYM	DESCRIPTION	DATE	APPROVED
A	Added figures 2-5, 2-6, 2-8, 2-9, 5-2, 5-3 and 5-4. Revised pages 2-2, 2-3, and 5-2.	8-11-69	<i>C. E. Kiffick</i>